

PROMOTION OF HIGH-GROWTH INDUSTRIES AND U.S. COMPETITIVENESS

HEARINGS

BEFORE THE

SUBCOMMITTEE ON SAVINGS, PENSIONS, AND
INVESTMENT POLICY

OF THE

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PROMOTION OF HIGH-GROWTH INDUSTRIES AND U.S. COMPETITIVENESS

WEDNESDAY, JANUARY 19, 1983

U.S. SENATE,
COMMITTEE ON FINANCE,
SUBCOMMITTEE ON SAVINGS, PENSIONS,
AND INVESTMENT POLICY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:32 a.m. in room SD-215, Dirksen Senate Office Building, Hon. John Chafee (chairman) presiding.

Present: Senator Chafee.

Also present: Representative Ed Zschau.

[The press release announcing the hearing and the opening statements of Senators Chafee and Dole follow:]

[Press Release No. 82-178, Dec. 22, 1982]

FINANCE SUBCOMMITTEE ON SAVINGS, PENSIONS AND INVESTMENT POLICY SETS HEARINGS TO PROMOTE HIGH-GROWTH INDUSTRIES AND U.S. COMPETITIVENESS

Senator John H. Chafee (R-R.I.), Chairman of the Subcommittee on Savings, Pensions and Investment Policy of the Senate Committee on Finance, announced today that the Subcommittee will hold hearings on Government policies to encourage the emergence of high-growth industries based on new technologies. The hearings are scheduled for Wednesday and Thursday, January 19 and 20, 1983 at 9:30 a.m. each day.

In announcing the hearings, Senator Chafee noted the "vital importance of the high-growth, technology-based industries to the creation of U.S. jobs and exports and to the enhancement of our competitive stance in world markets."

"If the American economy is to generate new, high quality jobs," Chafee said, "there must be an emergence of firms capable of rapid growth and an ability to compete strongly in the world market."

"While much attention has been paid to the impact of artificial trade barriers on traditional U.S. industries, the long-term solution to our trade problems and the creation of jobs is to encourage the development of high-technology industries in which we hold a competitive advantage. We also need to encourage the underlying research and development on which such new industrial growth must be based. The purpose of these hearings is to identify those Government actions available to assist innovative, technology-based American industry," the Senator said.

"Some of the questions the hearings will address are: What changes in tax and other laws should be made to spur the growth and competitiveness of technology-based industries? Is the Nation's savings rate adequate to provide sufficient investment in new high-growth industries? Should it be the policy of the Federal Government to channel investment funds to technologies and industries with potential for rapid growth? Are current research and development expenditures sufficient to allow the generation and successful application of new technologies? Is the level of "human capital"—the education and training of the labor force—adequate to complement rapid technological advances?"

These hearings will explore how Federal policy can assist, and avoid hindering, the transition to an economy based upon rapid innovation and highly specialized

professional services. In order to secure our economic future, it is vital that American industry made a fundamental commitment to the development of new technologies," Chafee said. "We need to learn how the Federal Government can help industry in creating more and better American jobs."

Senator Chafee stated that testimony at this hearing would be received from invited witnesses only. A list of witnesses will be announced at a later date.

OPENING REMARKS OF SENATOR JOHN H. CHAFEE, CHAIRMAN, SENATE FINANCE COMMITTEE, SUBCOMMITTEE ON SAVINGS, PENSIONS AND INVESTMENT POLICY

The U. S. economy is gripped by serious problems echoed throughout the industrialized world. High unemployment, idle industrial capacity, low rates of capital investment, and weak consumer demand mark the current situation. Responses to these problems differ sharply. Some would have us close our markets to foreign competition in a self-defeating effort to make U.S. jobs "safe" from foreign encroachment. Others, who fear that the U.S. is "de-industrializing," argue for policies that would focus on salvation of the older industries. They would seem to want us to turn back the clock in an effort to recreate the heyday of smokestack capitalism.

I believe that there is a sounder and far more exciting option. It is to embrace and to hasten the future—to concentrate our energies on the new, emerging industries that could provide the thousands of high-quality, new jobs that will be the basis for sustaining and enhancing our national quality of life.

These hearings provide an opportunity to set our sights on this more exciting vision of the future. We wish to examine the ways in which government can encourage the development of the new high-growth industries based on new technologies. This will mean encouraging research and development, stimulating substantial private investment in new companies and new technologies, and taking many other steps that our witnesses, I am sure, will suggest. I believe that these issues are an appropriate focus for this Subcommittee.

The rewards are proven and they are overwhelming in their promise and potential for our lives. In 1965, the first communication satellite could carry 240 telephone calls simultaneously. By 1980, these satellites could handle 6,250 simultaneous calls. The next generation of satellites will handle over 12,000 such calls.

The opportunities are very great. According to one projection, the worldwide robot market will exceed \$3 billion by the end of the decade alone, with the potential that the U.S. market share could be \$2 billion by that date. But this will depend on aggressive, persistent effort on the part of the U.S. companies now competing in this field—on their response to the Japanese effort to target this industry for dominance.

Innovation and growth also depend on the human factor. Ultimately, our future will be determined by the quality of our human skills, our imagination, entrepreneurship, and education. But we are now experiencing potentially crippling shortages of the skills that are key to high growth technologies—skills ranging from tool-makers to electrical engineers.

There can be a bright future for American industry. But many problems stand between the dream and the reality. We are here today to explore these problems and to find ways in which government can assist in their solution.

STATEMENT OF SENATOR DOLE ON "HIGH-GROWTH" HEARINGS

I would like to congratulate Senator Chafee for calling these hearings. They are very timely, coming when there is a great amount of public interest in how more rapid industrial innovation can help improve our economic performance. There is also a consensus that the American economy in entering a period of structural change, as we become less dependent upon traditional manufacturing industries and new products, such as those coming out of the microelectronics industry, make gains. We need to better understand the implications of this transition, if public policy is to keep pace with our dynamic economy.

The American economy faces three basic challenges in the 1980s. First, we need to boost the growth of productivity. The last 15 years have seen a drop in the rate of output growth in the United States. According to the Bureau of Labor Statistics, output per man-hour grew at an annual rate averaging 3.3 percent between 1948 and 1965; since then the average gain in productivity has been just 1.6 percent. While there are differences of opinion as to why this slowdown occurred, there is no disagreement about its consequences. The slowing growth in GNP has held down living standards, made the fight against inflation more difficult, and worsened our competitive position in world trade markets.

A second challenge is to create more and better jobs for Americans. Of course, a good deal of our current unemployment is due to the recession, and we anticipate that a robust economic recovery will absorb most of the unemployed. But it is also clear that there has been an increase in structural unemployment, due to the decline of basic industries like autos and steel. Many areas of the country will still face a serious unemployment problem even after the economy picks up. We want to know if investment in new technologies holds any promise for increased employment in the midwest and southeast. Also, can workers who have lost their jobs in the declining "smokestack" industries be usefully employed in these "high-tech" industries? If so, what kinds of retraining would be necessary?

The third challenge is to maintain our competitive stance in world markets. To a large extent this means developing new products, rather than trying to reestablish markets for manufactured goods for which we no longer have a productive advantage. The United States still holds an advantage in the development and application of new technologies. That this is where our future lies in world trade can be seen from the balance-of-trade accounts. Manufactured products that are R&D intensive produce a substantial trade surplus for the United States, and this surplus grows each year.

There is little doubt that the solution to all three challenges is to increase the pace of technological innovation. According to the best available evidence, the development of new products and processes has been at least as important as increased capital formation in stimulating GNP growth. It is likely that industrial innovation will become an even greater influence as the "high-tech" revolution continues to transform the American economy in the 1980's.

Of course, the driving force behind industrial innovation is research and development. The 1981 Economic Recovery Tax Act expanded incentives for R&D, and it appears that R&D spending is up in 1982. We need to know to what extent this is due the ERTA provisions.

While we also want to inquire about what other policy changes can advance the development of new technologies, we must be mindful of the difficult budget parameters that we face this year. The best way to stimulate R&D, and the successful application of existing technologies is to foster conditions of high employment, low interest rates, and low inflation. Therefore, reducing budget deficits may be the most helpful policy for both high-tech and traditional industries.

Senator CHAFEE. I want to welcome everyone here today. These hearings will focus on policies that the U.S. Government might pursue to promote those industries that we see as high-growth industries for the future.

The U.S. economy is currently gripped by a host of serious problems—problems which are echoed throughout the industrial world. We have high unemployment, we have idle industrial capacity, we have low rates of capital investment, and we have weak consumer demand.

Responses to these problems vary. Some would have us close our markets to foreign competition in what I view as a self-defeating effort to make U.S. jobs "safe" from foreign encroachment.

Others who fear that the United States is going through a deindustrialization argue for policies that would focus on the salvation of our older industries. They seem to want to turn back the clock in an effort to recreate the heyday of smokestack capitalism.

I believe that there is a sounder and far more exciting option available. That is to embrace and hasten the future, to concentrate our energies on the new emerging industries that could provide the thousands of high-quality, new jobs that will be the basis for sustaining and enhancing our national quality of life.

These hearings provide an opportunity to set our sights on this more exciting vision of the future. What we wish to do during these hearings is to examine the ways in which all levels of government, can encourage the development of new high-growth industries based on new technologies. This, of course, will mean encour-

aging research and development. It may mean stimulating substantial private investment in new companies and new technologies, and taking other steps that our witnesses may suggest. These issues are an appropriate focus for this subcommittee.

The rewards, are proven and they are overwhelming in their promise and potential for our lives.

Just a tiny example: In 1965 the first communication satellite could carry 240 telephone calls simultaneously. By 1980, 15 years later, these satellites could carry not 240 calls but 6,000 simultaneous calls. The next generation of satellites will handle over 12,000 such calls.

The opportunities are certainly great. According to one projection, the worldwide robot market will exceed \$3 billion by the end of this decade, with the potential that the U.S. market share of this could be \$2 billion. But all this will depend on an aggressive, persistent effort on the part of U.S. companies now competing in this field—on their response to the Japanese effort and the efforts of other nations to target this industry for dominance.

I just returned from a trip abroad. The Japanese are not alone in targeting industries. The English and the West Germans are getting into this. Some, more than others, have targeted certain industries for dominance.

Innovation and growth also depend on the human factor. Ultimately, our future will be determined by the quality of our human skills, our imagination, entrepreneurship, and education—with a particular accent on education.

We are now experiencing potentially crippling shortages of the skills that are the key to high-growth technologies, skills ranging from toolmakers to electrical engineers.

There can be a bright future for American industry. But many problems stand between the dream and the reality. We are here today to explore these problems, but more importantly to explore solutions and how Government can assist in these solutions.

We have a host of excellent witnesses today and tomorrow.

We are delighted to start off with our first witness, Congressman Ed Zschau, who has a distinguished career in advanced technology industries. I am seeking a better word than "high-tech." It is so abused. So, to the extent I can, I'll avoid the use of it.

Congressman Zschau, founded and served as president of System Industries, Inc. He has been a director of the American Electronics Association, and has been a professor at Stanford University. We have to use the past tense in all of these, now that you have assumed your new duties.

So, Congressman Zschau, we welcome you here.

STATEMENT OF HON. ED ZSCHAU, MEMBER, U.S. HOUSE OF REPRESENTATIVES, STATE OF CALIFORNIA

Mr. ZSCHAU. Thank you very much, Senator Chafee, for the opportunity to be here this morning to have the chance to participate with an outstanding list of witnesses.

I want to commend you for holding these hearings and for the fine efforts in putting together the list of witnesses. I think we're

saving the best for later. I'm pleased to be able to kick off the proceedings.

I have the privilege of representing California's 12th Congressional District, which includes that part of Santa Clara County that's called Silicon Valley.

In my district and the surrounding area, we have about 750 to 800 advanced technology firms, if you want to use that word—a lot of electronics, a lot of computer firms—but we also have pharmaceuticals, bioengineering. There is even a firm, Levi Strauss in San Francisco, that does another kind of jean splicing that you may have read so much about.

We have, in addition, research organizations. We have the Stanford Linear Accelerator Center, we have a NASA installation and SRI International. A variety of technologies abound in the area.

As you mentioned, the perspective that I hope to bring to this hearing is that of a former professor at the Stanford Business School. I left that about 14 years ago to learn something about business rather than continue to teach it.

I started a company, System Industries, and we made a lot of the mistakes that young companies are prone to make, struggled in an environment in the mid-seventies where there wasn't much capital available.

Yes, we made some payrolls, and I can say I met a payroll, but I've also missed a few as well. We had some venture capitalists who made the initial investments, and they said, "We have really deep pockets." The notion was that there was more capital there if we ever needed it. However, I found, during the recession of 1974 and 1975, that even though their pockets may have been deep, their arms were real short at that time, and we almost went under.

Today System Industries employs about 550 people. What is unusual about this is that it's not unusual. In the Silicon Valley area, that's more or less average performance, to go from nothing to 500 people over a decade or a decade and a half.

What I'd like to do today is talk about, from my perspective, how this process evolves, how these companies get started and innovate and grow. By so doing, I hope to provide a context for some of the other testimony.

So I see my role as primarily background and context. But I do have a theme. It's a point that I want to make, and this is it:

This country and advanced technology have been successful in the past because of an entrepreneurial spirit, a spirit of risk taking, a spirit of investment, a spirit of innovation. I believe that our strategy for the 1980's and beyond should be to enact government policy that fosters that same sort of spirit—I would call it an "entrepreneurial industrial policy," if you will. We can't afford to lose our entrepreneurial spirit, because it is a strength that this country has developed and is necessary for its continued growth.

Before I begin with the background I would like to make one comment. Some have suggested that we abandon the mature industries the so-called smokestack industries and focus our attention on the new ones. I agree that extent we have to pursue growth and opportunities, but I don't believe it's realistic to abandon the mature industries.

I don't believe in beating a dead horse, but I think that we must, with an entrepreneurial industrial policy, create an environment which encourages growth, innovation, risk taking, productivity improvement, and exports in all industries where such opportunities exist, and not try to narrow our focus just on high technology or advanced technology industries.

What I'd like to do in providing some background is to describe the entrepreneurial process, how companies get started, talk about its requirements—what is required to foster the entrepreneurial process, and then discuss the role of the entrepreneur.

When I conclude, I'm going to make some specific suggestions about government programs and suggest that an appropriate role of the Federal Government is very similar to that of our entrepreneur in his company.

About 3 years ago one of my vice presidents came into my office—he is the vice president of engineering—and said, "Ed, it's been great working with you at System Industries, but I'm going to leave. I'm going to start a new company."

I wished him well, because the excitement of starting a new venture is something that I would encourage everyone who has the skills and the fortitude to do.

Why did he leave? I think there were probably some psychic rewards—he wanted to see whether he could run a company, start it from scratch—but primarily it was the financial reward. By starting something from scratch, the opportunity to build net worth is much greater than working in any established company. As you can tell, the capital gains tax, which relates to the amount of taxation on the capital increases that you get from growing a company, is very critical to whether or not such a venture will be started.

In addition, the entrepreneur has to have confidence. And I believe that confidence is stimulated not only by an environment in the economy which indicates that it is possible to be successful but also, to a certain extent, by naivete: If you know all the ways to fail, you probably won't start. I think an entrepreneur is somebody who doesn't realize the job he is doing is "impossible", and so he starts to do it in spite of that fact.

Typically, as it was in this case, the entrepreneur has the idea for a product. It may be an improvement on an existing product, a new approach, and very often a product based on a new technology. Therefore, in order for this process to take place, we have to have a strength in basic research in this country that is continually producing new technologies that provide the basis for new opportunities and new ventures.

The next step in the process is to put together a team of individuals. You can't do the job by yourself. It's important to get skilled people who are willing to band together with you and start out in this new venture.

Usually they are leaving a key job in another company. So we must provide financial incentives for them. Not only is the capital gains tax important for this but also the attractive tax treatment of stock options. It is not possible to pay them enough with cash and salary to make it worth their while. However, by being able to have attractively taxed stock options it's possible for the entrepreneur to attract out of an established firm his starting partners.

Then of course you need the initial financing. In this country, since the tax on capital gains was lowered in 1978, there has been a massive outpouring of capital into funds called venture capital funds. We have a whole host of them in the Silicon Valley area, but they are distributed throughout the country.

The most important single factor in making that venture capital available has been the reduction of the capital gains tax.

The investor, however, in addition to looking at the opportunity, has to see a way to cash out at the end. That is, he doesn't want to make an investment in a private company if there is no way that he is going to get his money out. That can come through merger or acquisition, but I believe that a strong public equity market is critical to that venture capitalist making the initial investment. If he doesn't see an opportunity for this company, if it's successful, to go public and for him to be able to liquidate his investment eventually, then he is not going to be interested in making it in the first place.

When he analyzes the investment, he'll look at the people. That's why putting the team together is so important. He'll look at the technology; that's why having a strong technical base is so important. He'll look at the market opportunities. Even though there are high risks—either the possibility of failure or product obsolescence by the time you get the product done—and although he has to look at a long timeframe, if there is a big enough potential he will make the investment.

The important point here is that you can't finance new ventures, entrepreneurial ventures that have these new improvements in technology, with either debt or with internally generated funds. It takes constant injections of risk capital. That's why I say the lowering capital gains tax rate has been so important. Lowering it still further would be even more important to unleash the capital that's necessary.

Senator CHAFEE. How low would you go?

Mr. ZSCHAU. In California we did an interesting experiment. We passed a law in California that places a zero tax on capital gains for equity investments in small companies that are held over a period of 3 years. If you make an investment in a small private company and you hold it for 3 years, when later it's sold, you pay no tax on the capital gains.

Senator CHAFEE. In California.

Mr. ZSCHAU. In California.

Our trading partners abroad, Japan and West Germany, have also a zero tax on capital gains for many equity investments. I don't think that that's out of the question.

My own approach would be to continue to lower it, so long as we continue to get good results. Also, we should probably target such reductions on equities or equities in small companies.

As the small business expands, it needs these constant injections of risk capital, but in addition it needs trained technical people. Sure, when you start out you can rob your next-door neighbor of his good people, but as the company grows in order to provide the personnel that are necessary we have to have more trained technical people.

The electronics industry's greatest obstacle to growth today may be the scarcity of trained engineers from our colleges and universities. Even though our country is twice the size of Japan, we turn out fewer trained electrical engineers and engineers annually than Japan does.

It's very expensive to train engineering people. You need equipment you need a well-paid faculty.

In addition, as the company grows you need to expand exports. The market opportunities abroad are enormous. You will be hearing tomorrow from David Packard, the chairman of the Hewlett-Packard Co. Almost half of Hewlett-Packard sales are made abroad. If a company only sells in the United States, you really can't capitalize on the technology increases that you have made.

So, to summarize, in order to have new ventures that generate new ideas and technological advances which create jobs as they expand rapidly, you need in this country a constant source of basic research that is going on. No single company can afford to do the kind of basic research that is necessary. In my opinion you need universities, to a certain extent federally funded, to provide that basic research.

Senator CHAFEE. How available is that basic research from the universities? How do you get your hands on it?

Mr. ZSCHAU. University research is published broadly. As people make developments in their university research they publish them. Often those ideas can be seized by someone who reads the publication, meets with the professor, and develops the idea for commercial purposes.

Also, you need ample amounts of risk capital; you need incentives for personal risk taking, as I've mentioned; you need an adequate supply of trained technical people; you need international trade opportunities; and a generally good economic climate.

And those are the factors as I see them that are necessary for us to continue to expand the opportunities, much as we have in the past.

My feeling is that Federal policy ought to be focused on making sure that those requirements are met in the environment in this country.

Now, I mentioned earlier I was going to talk about the role of the entrepreneur, what the entrepreneur really does.

The entrepreneur provides the initiative, the original opportunity. He attracts the good people through incentives. He creates an environment within the company that has enough freedom for those people who generate new ideas, and then he deals with the outside environment to make sure that adequate resources and expanded opportunities are there.

The typical entrepreneur in his own company takes enormous risks, because he realizes that in order to achieve innovation you have to give freedom. You can't force innovation, you can only foster it through a free environment in the company.

I'd like to suggest that's the same way that we should think of the role of the Government, as an entrepreneur rather than a tightly controlled professional manager. The Federal Government should be creating an environment with ample opportunities. It

should create incentives and be prepared to take the risks for freedom in the country to pursue various things.

Senator CHAFEE. We agree with that, but could you be specific? In other words, you have given me a list of those things that constitute the entrepreneurial spirit and that contribute to the success of a new venture. You have talked about the ingredients being the attractive treatment of stock options, the capital gains tax, the need for venture capital, the need for an equity market and sales abroad, the need for technical people, the need for basic research. Let's say we agree with all of those. What, then, is government doing wrong and what can we do better,

Mr. ZSCHAU. Let me make a series of specific suggestions at this point, and I'll divide them in the way in which I've talked about it before.

First, in generating the opportunities, I think it's important, even though we are facing some severe budget problems, to continue to fund the basic research—university research in this country in the fields of energy, in the fields of electronics circuitry, in the fields of particle physics and the basic physical processes.

It's very easy to make cutbacks in those fundings at a time when there is pressure, and you may not see the impact of the cutbacks at the time you make them. However, in the years ahead, this country will pay for a policy of cutting basic research at the Federal level.

Let me go on to the area of incentives. I think, as we've just discussed, a further lowering of the capital gains tax is something that we ought to consider, but perhaps focusing it on equities rather than all kinds of capital.

We enacted legislation to get a more favorable treatment of stock options, but we fell short of where that could have gone. I think that a full capital gains treatment on stock options is appropriate and would provide personal incentive.

R&D tax credits that were enacted in 1981—they are due to expire in 1986. Those should be continued.

Senator CHAFEE. That was just for the incremental amount over a base.

Mr. ZSCHAU. That's right. In 1981 we passed a 25-percent tax credit on research and development expenditures above the average over a 3-year base period, but that tax credit is due to expire in 1986. I believe it should be continued.

Senator CHAFEE. Do you think it has been successful?

Mr. ZSCHAU. I believe it has. There are specific colleagues of mine that I've discussed this with who have said that because of that tax credit they pursued R&D expenditures that otherwise they would not have pursued.

We currently have restrictions on the amount of money that pension funds can invest in small companies. I think that those restrictions should be loosened in order to make available the enormous amount of pension fund money to the growth companies.

Our antitrust laws are currently restricting, or at least providing concerns to those companies who try to pool their research.

Senator CHAFEE. I believe we are going to hear a lot about that. Do you really see companies pooling their research? How are you

going to tell which is yours and which is theirs or who gets the results?

Mr. ZSCHAU. Well, the way it's done is to form a research joint venture among companies pursuing research in a given area that no single company feels it can afford to pursue individually. And the results of that research is then shared by the companies to commercialize as they see fit.

Senator CHAFEE. Suppose IBM and GTE and Hewlett-Packard go in together? Where does that leave the little fellow?

Mr. ZSCHAU. Of course we have to look at antitrust legislation in a broader context. We are competing not just against other U.S. companies in this country. We are competing against consortiums from abroad. If we, through our antitrust policy, try to make sure that no single company gets too large, all of them may be beaten in the competitive battle by the foreign consortiums who are able to do this.

Well, let me just say that we are at a crossroads. The question is going to be whether the Federal policy is focused on risk-taking, investment, and growth or whether it merely seeks to avoid failure.

I feel that the sorts of suggestions I've made to promote research, risk-taking, investment, technical education, and exports will make this country stronger in world markets and enable us to expand and create more jobs.

Senator CHAFEE. How many jobs do you think have been created in your district in the last 10 years through this type of operation I don't need an exact figure, but just roughly.

Mr. ZSCHAU. The American Electronics Association did a study in 1978 of about 225 companies. Over a period of time of 20 years, roughly 750,000 jobs were created. Now, not all of those companies were in my district, but the important point in that study was that it wasn't the mature companies, the larger companies like Hewlett-Packard or IBM, that were generating the most jobs. Rather, it was the small companies that were just starting that, on an absolute basis of new jobs per-year per-firm, were generating more jobs. They were the job-creation engines in our industry.

I don't know the specific number in my district that have been created, but I do know that it's been the small companies rather than the larger companies in our industry that have created the most jobs.

Senator CHAFEE. Thank you very much, Congressman Zschau. If you would like to join me at the podium, I would welcome you up here. I know you are interested in this area, so please stay as long as you like.

Mr. ZSCHAU. Thank you very much.

[The following information was inserted for the record:]

ED ZSCHAU
12TH DISTRICT CALIFORNIA

Congress of the United States
House of Representatives
Washington, D.C. 20515

January 19, 1983

The Honorable John H. Chafee
United States Senate
Washington, D.C.

Dear John:

I appreciated the chance to appear at the hearings you held this morning on promoting high technology and competitiveness in the United States. This is such a critical issue for our country. I'm glad to see you take a leadership role in bringing together experts on the subject who can contribute to formulating specific initiatives that would help.

I was even more pleased to have the chance to sit with you during the hearings and not only listen to all the testimony but question the witnesses about specific items on my mind. Since this was the first time I have ever been on the other side of the table during testimony, it will always be for me a memorable experience.

I wanted to summarize briefly the major thrust of my remarks this morning in case such a summary would be helpful to you. My main theme was to emphasize that it has been our entrepreneurial spirit in the United States that has made us successful in the past, and it remains a competitive advantage that we must preserve. I believe our federal economic policy should be an entrepreneurial industrial policy designed to create an environment that fosters an entrepreneurial approach, not just in new ventures, but throughout the economy in all those enterprises that have the opportunity to expand and create new jobs.

I tried this morning to describe the entrepreneurial process -- how young companies get started -- and based on that description summarize what is required in order for that process to be fostered. I'll list here a summary of those needs and the specific policy proposals I feel would help to meet those requirements.

1. We must foster in this country a continual emphasis on basic research which is needed to provide the foundation on which high technology enterprises and new products will be based. Basic research typically cannot be pursued by individual companies because its results are a long time in coming and the probability that a useful product will emerge from the research is too low to justify the expenditure. However, if we don't have a continual basic research activity we won't have the technological foundation on which to build our economy, business, and products in the coming years.

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I have two suggestions to address this requirement:

(a) increase rather than decrease federal funding of basic research carried out in universities, and

(b) alter the antitrust laws to permit the establishment of multi-corporation research joint ventures which would enable U.S. companies to pool their research resources and share in the results that are produced.

This latter approach would enable our companies to compete more effectively against the consortia that have already been established in foreign countries.

2. We must assure that there are ample amounts of risk capital available to finance the start up and growth of new enterprises and the continual expansion of established companies. In a study conducted by the American Electronics Association in 1977, it was shown that it takes about \$14,000 of risk capital investment to create each new job in the electronics industry. Since then the number has probably increased due to inflation, but the point remains that new jobs aren't created out of thin air. We need risk capital to finance them.

Specific recommendations to ensure a continued flow of risk capital are:

(a) lowering the capital gains tax still further, but focusing such reductions on equities rather than covering "non-productive assets" such as real estate and collectibles. Some people argue that such reductions should be targeted only on small companies, but I feel that there are also capital needs for larger companies that should be encouraged by lowering the tax on capital gains. Lower capital gains tax rates may make it less necessary for the larger companies to pay as much in dividends in order to attract investors, thereby permitting them to retain more of their capital for internal investment, and

(b) relax the restrictions currently in place on pension funds, including IRAs, that prevent them from investing so much in high growth companies.

3. In addition to capital we need ample incentives for risk taking, both by companies and by employees. Specifically,

(a) the R & D tax credits should be extended past 1986. In fact, it is unfortunate that they were established with such a short life since many of the programs which such tax credits would ordinarily encourage have lives and therefore financial commitments that extend beyond the three years. In addition, I think we should look at deepening and narrowing the R & D tax credit, that is, restrict the tax credit to true research and development rather than categorizing such activities as start up manufacturing and marketing research as R & D, and at the same time increase the percentage to some higher level like 35 or 40 percent; and

(b) remove the cap on the incentive stock options and provide true capital gains tax treatment rather than including the gain from the ISO in preference income.

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4. We must ensure that we have an adequate supply of trained technical people. This is a critical problem that has only recently been recognized. The future demand for engineers and technicians is predicted to far outstrip the supply. Moreover, the cost of educating such people is high and it is difficult to attract enough qualified professors because industrial salaries are so attractive. I believe this shortage of technical personnel can only be solved with more money. Already the American Electronics Association and the Massachusetts High Technology Council have established industrial giving programs that collect money from corporations and use it to fund faculty salaries and equipment. However, I believe the federal government has a role to play too. Specifically,

(a) we should extend the R & D deductions and tax credits to include contributions to colleges and universities for teaching in addition to research;

(b) consider establishing a program of matching federal grants for increasing engineering department capacities;

(c) make sure immigration policy is complementary to the need for trained technical people. That is, we should make it easier for foreigners who have those needed skills to remain in this country.

5. We need to expand our international trade opportunities. Specifically, this country must pursue an aggressive trade policy aimed at achieving free and fair trade. The Danforth reciprocity legislation would be a step in the right direction.

Also, we should retain the DISC. It's essential to expanding exports of the growth companies. Although it can be argued that DISC violates the GATT treaty, that argument has been in existence for years and has questionable validity. In any event, if the DISC must be eliminated, we should not do so until we have a substitute incentive for those companies to increase exports.

6. Of course, high technology, low technology, and all businesses can only achieve their potential within a generally good economic climate. That means we must have low interest rates and low inflation. People are unwilling to make investments, to make long-term commitments, or to borrow the funds needed for expansion in a climate of high interest rates and inflation. In my opinion, the substantial projected budget deficits for the next several years must be reduced significantly in order to take the upward pressure off of interest rates and inflation.

Let me close by saying that I hope to have the opportunity to work with you on these issues. From a personal standpoint and from the standpoint of my district, promoting high technology, competitiveness, and economic growth is my top priority. I have been asked by Congressman Jim Martin, chairman of the Republican Research Committee, to chair a Task Force on High Technology Initiatives. I will be forming that soon. I hope that in the future there will be ways in which we on the House side can work together with you and your colleagues in the Senate to formulate and implement an entrepreneurial industrial policy.

Sincerely,



Ed Zschau
Member of Congress

Senator CHAFEE. Our next witness will be the distinguished Secretary of Commerce, Secretary Baldrige accompanied by the Assistant Secretary, Bruce Merrifield.

I know the Secretary has a busy schedule; he has been straightening out our problems with Japan this morning and will deal with the growth or lack thereof of the GNP later this morning.

So we welcome you, Mr. Secretary.

STATEMENT OF HON. MALCOLM BALDRIGE, SECRETARY, DEPARTMENT OF COMMERCE, ACCOMPANIED BY DR. BRUCE MERRIFIELD

Secretary BALDRIGE. Thank you very much, Senator. I am pleased to follow Congressman Zschau. We both enjoy the distinct advantage of having been born in Omaha, Nebr., and he went west and I went east, but we got a good start.

Mr. Chairman and members of the subcommittee, thank you for this opportunity to express my views on government policies to promote high-growth new-technology based industries and to increase U.S. competitiveness.

Dr. Bruce Merrifield, the Assistant Secretary of Commerce for Productivity, Technology and Innovation is accompanying me today, and can assist with any questions you may have. With the Chairman's permission I would like to summarize my written testimony, but request that my whole written statement appear in the record as if read.

Senator CHAFEE. No objection.

Secretary BALDRIGE. We are in the midst of a major economic transition which will require large segments of our older capital-intensive industries to make very significant economic adjustments.

Part of that transition is explained by the fact that we are experiencing a worldwide explosion in new technologies. Microelectronics, biogenetics, robotics, other new technologies are the foundation of our future economic growth.

These technologies will create an unparalleled array of new businesses, and new businesses of course mean new jobs, and that's what we want to talk about.

Today technology-intensive U.S. industries are already making important contributions to our productivity growth rate and our overall trade performance.

Our economic recovery and long-term economic well-being are going to depend increasingly on the emergence of high-technology industries; but American leadership in world technology is not necessarily assured even through the 1980's. Our dominance is already eroding in industries like steel, automobiles, machine tools, and consumer electronics.

Part of the reason for this erosion is that other nations are rapidly expanding their technological activities. Ten years ago the United States, with 5 percent of the world's population, generated about 70 percent of the world's technology. Currently we generate about 50 percent of it, and by 1990 we will probably be contributing only 30 percent. And that's despite the fact that America will be doing more and more research and development every year. The

pie is getting larger, but the other 95 percent of the world will be increasingly engaged in dividing it.

Another reason is found in the advent of targeted industry strategies. This approach was pioneered by Japan, but is now being initiated by other foreign nations. France comes to mind as an example.

This strategy pools technology and resources to achieve economies of scale that are beyond those attainable by most individual U.S. manufacturers.

I would note, however, that not all targeting efforts have been successful and that nations employing them must pay in other ways—by higher domestic prices and by denying resources to other sectors.

The last reason I will mention for the erosion is that, with slower economic growth worldwide, we are faced with more nations hustling for a larger share of a decreasing world export market. And while this is going on, the heavy debt burden of many developing countries prevents them from buying the exports of the industrialized nations.

That's going to be particularly important in the near future as far as the United States is concerned, because the developing countries have an external debt of about \$500 billion—which can only be paid off with export earnings. Every developing country is going to have to export more in order to bring down that debt. So we are going to see a lot of competition in world trade for exports.

I don't have the exact figures with me today, but we have somewhere between 40 and 50 percent of those developing countries' market for our exports, and that's very important to us.

In the face of this, what strategic options do we have?

Well first, we could accept the gradual shutdown of many of our industries. Clearly, that option is unacceptable.

Second, we could surrender to pressure and raise trade barriers. Some elements of our society are exerting strong pressure on Congress to enact protectionist legislation. This pressure will continue until our economy recovers or as long as foreign competitors are perceived as taking unreciprocated advantage of our open markets.

It would be a very grave mistake to give in to such pressure. Insulating our industries from fair foreign competition would be to no one's benefit. With protectionism, prices go up, quality goes down, and the protectionists' promise of a flourishing domestic industry with more jobs never materializes. Fair competition—and I stress "fair"—be it domestic or foreign, is necessary to make our free market system work and make it strong. That's been proven too many times to have any doubt about it.

When we went the protectionists' route in the early 1930's under the Smoot-Hawley tariff bill, I think the figures were that world trade dried up as much as 60 percent in 2 years. That prolonged the Great Depression; it didn't help to end it by protecting our industries. And since World War II, I think it's a demonstrated fact that free trade has helped this country more than any other country. For that reason, we ourselves would be hurt most if we went back to a protectionist stance that spread around the world.

But let there be no doubt, Mr. Chairman, our businesses do have a right to be protected from foreign unfair trade practices. We will

vigorously oppose foreign practices that are illegal under the GATT or that violate U.S. law.

Rather than accepting mass exit from some industries or raising trade barriers, there is a third option. We can remove barriers and disincentives to increased exports of our own products and services; we can better mobilize our own resources and capabilities; we can remove barriers to increased productivity; and we can provide incentives for collaborative and innovative technological efforts that will allow us to compete with foreign government "targeted industry" policies. Meeting the competitive challenge in this way makes far more sense, it seems to me, than isolating ourselves and allocating resources inefficiently through protectionism.

We have taken a variety of steps to increase exports: we have substantially eased taxation of foreign-earned income—

Senator CHAFEE. That reduction is for individuals.

Secretary BALDRIGE. Yes.

Senator CHAFEE. We haven't provided the reduction for corporations, have we?

Secretary BALDRIGE. No, we haven't changed that, but that is not the big problem that "double taxation" of Americans living abroad was. Double taxation had a tremendous adverse effect. We have testified at length on that, and I'm very glad to say that that legislation easing it was passed in 1981.

And I might add, Senator, that in the trade missions I have led since I have been Secretary of Commerce to Saudi Arabia, Algeria, Cameroons, Ivory Coast, Nigeria, and Morocco, in every one of those countries American businessmen there came up to me and volunteered the information that that amelioration of the double taxation of Americans working abroad had made a tremendous difference to them. In fact, it had lowered their cost, enabled them to hire more Americans, and more Americans are going to tend to buy more American goods.

Senator CHAFEE. You are saying the right thing to the right person. [Laughter.]

Secretary BALDRIGE. We have streamlined export controls. At the Department of Commerce we had a backlog of 3,000 export-license applications when we came to Washington. That's down to close to zero now.

We supported the enactment of the Export Trading Company Act, which we think will be a fine asset to increasing our exports, particularly for medium and smaller size companies. And as you know, that was recently signed into law.

We have established an economic climate for increased investment in technology. The President's Economic Recovery Program has laid the foundation for sustainable noninflationary economic growth in the 1980's. We will see that growth begin this year.

We have lowered the growth rate of Government spending, reduced tax rates, relieved business of some burdensome regulation, and supported a policy of steady and moderate growth in our money supply.

To date the President's Program has lowered two important barriers to increased R&D investment—high inflation and high interest rates. Direct tax incentives for R&D have been provided through a 25-percent tax credit for incremental research, a 3-year

writeoff for R&D equipment, and increases in the allowable charitable deduction for donations of scientific equipment. The administration's tax policy also encourages R&D investment indirectly through an accelerated cost recovery system which induces R&D investment in the capital goods sector.

Some believe that our basic economic policy does not go far enough in promoting high-technology industries themselves. They believe that the Government should predict which future-oriented industries will be the winners, and channel investment funds toward them.

Trying to predict winners and channeling investment funds I think would be a mistake. Interventionist Government policies have really not worked in the past, and there is no reason to believe that we can make them work now. No Government agency is astute enough to target the right industries. Certainly no central group of politicians, or leaders of any kind, could do that and have a successful track record.

The targeting role belongs to the entrepreneurs, and to the rest of the private sector. It is the private sector's and not the Government's responsibility to finance the commercialization of new products and processes. The Government's role is to remove barriers and create a conducive environment.

To facilitate private R&D initiatives, I have launched an industrial technology partnership program to be led by Assistant Secretary Merrifield. This program will provide a framework for large-scale private sector R&D programs capable of competing with foreign "targeted industry" consortia that have focused tens of millions of dollars on research and development. Through the innovative use of R&D limited partnerships which minimize antitrust concerns, new products and process technology needed by industry can be funded and developed without direct Government intervention.

Dr. Merrifield will be pleased to describe R&D limited partnerships in as much detail as the subcommittee likes. I would just like to describe their essence.

A general partner—be it a trade association, a research institute, a college or university, a corporate subsidiary, or an entrepreneur—that has the ability to perform research and development or manage research and development by others, would determine, after consultation with potential end-users, how it could best meet their research and development needs.

The general partner would then enter into arms length contracts for the purchase by the end-users of the technology it develops provided the technology meets pre-set specifications. These contracts would then be used by the general partner to attract funding from individuals, venture capital firms, and other sources of capital, who would become limited partners.

The limited partners would bear the financial risk, would share in the financial success, and would receive tax benefits such as being able to deduct current expenditures made by the partnership for research and development.

Senator CHAFEE. Mr. Secretary, Dr. Merrifield has described this to me before. It sounds incredibly complex.

Is this the essence of your suggestion of how to pool R&D? In other words, you would not propose any changes in our antitrust laws?

Secretary BALDRIGE. No, sir. I believe the antitrust laws should be amended. But I think R&D limited partnership mechanism can clearly work without the laws being changed. I do not think it's too complicated, any more complicated than other things in business are. There are already about 650 of these that have put in some \$7 billion worth of investment.

I think one example that perhaps everybody knows is Genentec. The mechanism will work. It won't work all the time; but it's a very valuable tool where there is a need for R&D.

Senator CHAFEE. Dr. Merrifield drew a chart for me. It was incredibly complex.

Will you also seek some changes in antitrust legislation?

Secretary BALDRIGE. Yes.

A great many lawyers in the Antitrust Department believe that joint ventures in R&D do not violate the antitrust laws. However, businessmen are scared to death of trying joint venture R&D because they are not sure what the legal ramifications will be. The mere possibility of treble damages frightens business. And this is the dichotomy that we are going to try to solve.

I have had some conferences with Bill Baxter, the Antitrust Chief. He is aware of the problem. I don't have the specific recommendations now that I would like to see us come out with, but that matter has to be clarified.

Senator CHAFEE. Perhaps he could offer some guidelines.

Secretary BALDRIGE. Yes; and I am quite sure he will. I can't speak for him, but that has been the thrust of our conversations; because we have to be able to allow, in my opinion, American companies to enter joint ventures on research and development. And there shouldn't be just any one track; there ought to be many tracks they can go on.

Senator CHAFEE. What time do you have to leave, Mr. Secretary?

Secretary BALDRIGE. Well, I'm supposed to talk about the GNP to a bunch of reporters at 11 o'clock. So I have to leave in 20 minutes.

Senator CHAFEE. You probably want to put that off as long as possible, don't you? [Laughter.]

Why don't you summarize some of the other specifics? What I'm really looking for are some suggestions of things we should be doing.

On page 13 you mention the Patent and Trademark Office, and small business innovation research. How should we proceed?

Secretary BALDRIGE. Well, I think you are looking at the long written version of my testimony.

First, I think we should pursue the R&D limited partnership program, because even though you may think it is complicated, Senator, it is not as complicated as a lot of things that businesses have to struggle with in setting up any kind of entity. And this has been proven to work; it will work more in the future.

Second, we ought to clarify, and I hope broaden, the ability of our industry to enter into R&D joint ventures. I don't think there is any question about it. That is a very major point. And that is going to require the cooperation of the Antitrust Department.

Third, I think it is vital that we interpret or amend the antitrust laws in a way that permits our "declining industries" to merge where necessary. There is too much of a shadow of antitrust liability for some of our "declining industries" to merge. The shadow has to be removed, in my opinion, in some way or another, to permit mergers that would help those industries survive.

Besides our F&D limited partnership program, we have other policy initiatives underway to help our high-growth new technology industries. We have strengthened the Patent and Trademark Office. We are reducing the backlog of patent applications and speeding up application processing times. We are improving the validity of the patents we issue. Strong valid patents increase the prospects for the successful commercial development of inventions. The Small Business Innovation Research Act, recently signed into law by the President, requires Federal agencies to expend, ultimately, one and a quarter percent of their annual R&D budgets on innovative proposals submitted by small businessmen. This will make a significant pool of capital available to finance early-stage R&D consistent with Federal agency and national needs.

We are making progress on the commercialization of Government financed inventions.

Senator CHAFEE. How about tax policy? You have summarized tax policy in about seven lines. Would you change the capital gains tax?

Congressman Zschau went into that in considerable length. He mentioned both the stock options and the capital gains overall.

Secretary BALDRIGE. Yes. I think we have to take another look at our tax basis for research and development.

Senator CHAFEE. Do you mean the one we enacted in 1981?

Secretary BALDRIGE. Yes.

Senator CHAFEE. On the 25 percent?

Secretary BALDRIGE. Yes.

Senator CHAFEE. But you have nothing specific on the capital gains?

Secretary BALDRIGE. Well, I am speaking now as a former businessman. I can't say that this is the Administration's position yet. All I can say is what is my personal opinion.

I think the R&D provisions of ERTA and TEFRA took a great step forward, there is no question about that. The 3-year writeoff provision and the 25-percent incremental tax credit for R&D provide a great incentive, particularly for electronics firms. In a great many cases, new inventions in machinery and equipment were and are coming so fast, that the old Tax Code did not allow equipment and machinery to be written off before they were obsolete. I think we ought to continue to take a very close look at allowable write-off periods. Perhaps, we should permit R&D equipment to be currently expensed in the same way as we now do for R&D salaries. This would greatly benefit small emerging firms that could really show great future growth if they can get the start.

Senator CHAFEE. You have had breakfast, as I understand it, with the Prime Minister of Japan. We are in a situation here where they are targeting our industries. They are building a special city, Sakuba, where scientists can work and concentrate on tar-

getting our industries. Yet their market isn't open to us in many ways—limitations of access of our capital into their markets.

What do you suggest? What ought we to do about that? Because, after all, Japan is going to be the big competitor, certainly in the balance of this decade. What do you suggest?

Secretary BALDRIGE. Well, there is just no one suggestion that, if you waved a magic wand, would work in this situation. There are a whole series of things that I think have to be done.

One is, on their emerging industries in high technology, the Japanese carefully protect their home market while those very industries are growing up. That means that the United States, though we might be ahead in a particular field, as we are in a great many, finds it very difficult, through a series of barriers, to penetrate a protected emerging high-technology industry.

That gives the Japanese the benefit of all of the volume in their own home market, plus the benefits of the subsidies they give a targeted sector, to permit a weak 6-year old boy to grow into a 24-year-old professional football player. When the boy has grown into a superstar, then they open some barriers in their own country, while yelling for free trade around the rest of the world.

That has happened time and time again. That's one of the things that we have discussed with the Japanese, and we are working in that area with a high-technology subcommittee that has been meeting now for about 8 months.

Senator CHAFFEE. Do you mean a high-technology subcommittee in your Department?

Secretary BALDRIGE. Yes. Well, we have the U.S. Trade Representative in on it, and so forth, but it is lead by the Commerce Department. In this case, Lionel Omer, the Under Secretary for International Trade, is the chairman of it.

There is a subcabinet group, of course, led by the United States Trade Representative that covers a broader range, but we were specifically interested in the high technology part of it because of the way the Japanese target industries here.

Now, the Prime Minister and the Foreign Minister and the Trade Ministers absolutely understand our view of this problem. I don't think there is any question about it. I can't give you what their answer will be right now in the new Japanese administration, because Prime Minister Nakasoni has just begun his tenure. He seems to us to not only be interested in hearing all sides of the problem, but he looks like a man of action. I think that we will get more talk and less action. I think probably with the political circumstances the way they are, it will be a few months before we see anything more than what we've seen now because of the elections coming up in Japan, but I think we have to come to grips with this problem during this year and not keep putting it off. It has been put off in the past, and then you get an election year, and everyone gets busy doing other things.

So that is our intention.

[The prepared statement follows:]

TESTIMONY OF
MALCOLM BALDRIGE
SECRETARY OF COMMERCE

Mr. Chairman and Members of the Subcommittee, thank you for this opportunity to express my views on Government policies to promote high-growth, new technology-based industries and to increase U.S. competitiveness. Accompanying me today is Dr. Bruce Merrifield, Assistant Secretary for Productivity, Technology and Innovation.

Introduction

It is clear that we are in the midst of a major economic transition which inevitably will require major segments of our older capital-intensive industries to make significant economic adjustments. At the same time, however, there will be unparalleled opportunities for new jobs, growth, and increased profits.

Part of the transition is explained by the fact that we are experiencing a worldwide explosion in new technologies. Microelectronics, biogenetics, robotics, new materials, information sciences, and other new technologies are the foundation of our future economic growth. But these new technologies will make some major capital investments uneconomic before the end of their planned lives. In steel, open-hearth furnaces can no longer compete with basic oxygen

furnace technology, or the potential of new Swedish plasma technology. And in just a few years, we can expect graphite fiber reinforced plastics that are stronger than steel and lighter than aluminum to significantly compete for our metal markets.

However, the total impact will be positive. New technologies will create an array of new businesses, and new businesses mean new jobs.

Today, technology-intensive U.S. industries are making important contributions to our overall output and productivity growth rates, and to our overall trade performance. During the past decade, high technology industries as a group:

- ° had a growth rate of real output more than twice that of total U.S. output;
- ° had a productivity growth rate six times that of the productivity growth rate for all U.S. businesses; and
- ° raised prices only one-third as fast as our overall inflation rate.

Since 1975, our high-technology industries had a cumulative surplus of \$128 billion in high-technology-based trade compared with this Nation's cumulative \$148 billion deficit in overall merchandise trade.

Our economic recovery and long-term economic well-being heavily depend upon high-technology industries continuing to make these contributions. However, American leadership in world technology is not necessarily assured even through the 1980's. Our dominance already is eroding in steel, automobiles, machine tools, and consumer electronics.

Reasons for Erosion

Part of the reason for this erosion is that other nations are rapidly expanding their technological activities. Ten years ago the United States, with 5 percent of the world's population, generated about 70 percent of the world's technology. Currently, we generate about 50 percent of it, and by 1990 we may only be contributing 30 percent, despite the fact that America will be doing more and more R&D every year. While the pie is getting larger, the other 95 percent of the world will be increasingly engaged in dividing it.

Another reason is the advent of "targeted industry" strategies. Pioneered by Japan, this approach is now being imitated by other foreign nations.

Basically, and simply put, in each of the targeted industries, significant economies of scale are achieved by concentrating the number of participants, by limiting imports, by directing government procurement, and by emphasizing R&D investment in manufacturing improvements. Firms then export targeted products to the United States and other foreign markets at prices based on anticipated, rather than current, costs. These practices result in an increased market share; benefiting from economies of scale, costs eventually slip below prices.

In the past only existing markets have been targeted, but new emerging markets, such as computers, robotics, satellite communications, engineering plastics, fine ceramics, and biogenetics are now being targeted.

However, not all targeting efforts have been successful and the nations that employ them must pay in other ways -- by higher domestic prices and by denying resources to other sectors. Nevertheless, foreign government "targeted industry" strategies are part of today's competitive reality

and we must determine their impact on export markets, particularly where identifiable trade barriers are erected.

Still another reason why our competitive position is eroding is the industrial emergence of petroleum and natural gas-rich lesser-developed countries. A significant portion of our low value-added petrochemical business will progressively shift to these countries as turn-key value-added plants are installed there to take advantage of the availability of natural gas feedstocks at negligible cost. Part of our \$80 billion annual business in commodity petrochemicals such as olefins, polyolefins, ethylene glycol, acetic acid, alcohols and ammonia, will gradually shift to lesser-developed countries.

Furthermore, with slower economic growth worldwide, we are faced with more nations hustling for a share of a decreasing world export market. At the same time, the heavy debt burden of many developing countries prevents them from buying the exports of the industrialized nations.

In the face of all this, what strategic options do we have?

Strategic Options

First, we could accept the gradual shutdown of many of our industries. Clearly, this option is unacceptable.

Second, we can surrender to pressure to raise trade barriers. Some elements of our society are exerting strong pressure on Congress to enact protectionist legislation. This pressure will continue until our economy recovers or as long as foreign competitors are perceived as taking unreciprocated advantage of our open markets.

It would be a very grave mistake to give in to such pressure. Insulating our industries from fair competition would be to no one's benefit. With protectionism, prices go up, quality goes down, and the protectionists' promise of a flourishing domestic industry with more jobs never materializes. Fair competition, be it domestic or foreign, is necessary to make our free market system work.

However, let there be no doubt -- our businesses do have a right to be protected from foreign unfair trade practices. We will vigorously oppose foreign practices that are illegal under the GATT or that violate United States law. That is why we are pursuing stricter enforcement of United States trade laws and why I supported the trade legislation introduced by Senator Danforth in the last Congress.

Rather than accepting mass exit from some industries or raising trade barriers, there is a third option -- we can

remove barriers and disincentives to increased exports of our products and services; we can better mobilize our own resources and capabilities; we can remove barriers to increased productivity; and we can provide incentives for collaborative and innovative technological efforts that will allow us to compete with foreign government "targeted industry" policies. Meeting the competitive challenge this way makes far more sense than isolating ourselves and allocating resources inefficiently through protectionism.

We have taken a variety of steps to promote increased exports.

- we have substantially eased taxation of foreign-earned income as part of the President's tax package;
- we have streamlined our export controls on strategic trade and have eliminated the backlog of 3,000 export license applications which faced us when this Administration came to office;
- without weakening our opposition to bribery, we are working with the Congress to reform the Foreign Corrupt Practices Act to remove uncertainties in

that law that inhibit legitimate business transactions overseas;

- ° to encourage joint efforts by manufacturers, export management companies, banks, and others to take advantage of foreign markets, we supported enactment of the Export Trading Company Act, which was recently signed into law by President Reagan; and
- ° we have substantially reduced export credit subsidies and are studying ways to continue to make export financing available so that U.S. firms can compete on a basis comparable with financing provided by some foreign governments.

We have established an economic climate for increased investment in technology. The President's Economic Recovery Program has laid the foundation for sustainable non-inflationary economic growth in the 1980's.

We have lowered the growth rate of Government spending, reduced tax rates, relieved business of certain burdensome regulation, and supported a policy of steady and moderate growth in our money supply.

To date, the President's Program has lowered two important barriers to increased R&D investment -- high inflation and high interest rates. Direct tax incentives for R&D have been provided through a 25 percent tax credit for incremental research, a 3-year write-off for R&D equipment, and increases in the allowable charitable deduction for donations of scientific equipment. The Administration's tax policy also encourages R&D investment indirectly through an accelerated cost recovery system which induces R&D investment in the capital goods sector.

Another indirect boost to increased R&D investment is pro rata allowability of independent R&D costs to Government contractors. However, statutorily limiting the Government's participation in independent R&D expenses incurred by contractors, as was done regarding the Department of Defense in the Fiscal Year 1983 Continuing Resolution, may result in a decline in independent R&D by Government contractors -- an important source of new and innovative ideas. We must be careful that we do not erect new barriers to R&D investment as we remove others.

Some people believe that our basic economic policy does not go far enough in promoting high-technology industries. They

believe the Government should predict which "future-oriented" industries will be "winners," and channel investment funds to them.

Trying to predict "winners" and channeling investment funds would be a mistake. Interventionist Government policies have not worked in the past and there is no reason to believe we can make them work now. Resurrecting such devices as the Reconstruction Finance Corporation, whose post-war era was clouded by political favoritism and corruption, would be disastrous. As Nolan Bushnell, the California entrepreneur who founded Atari, was recently quoted as stating: "I guarantee you that no Government agency can target the right industry, I'll almost guarantee they'll target the wrong one." The targeting role belongs to the entrepreneurs and to the rest of the private sector.

Even though the Federal Government must fund R&D necessary for our national defense and basic, long-term, high-risk research in the non-defense sector, Federal support for R&D demonstrations and commercial development has been, and must continue to be, reduced. It is the private sector's and not the Government's responsibility to fund the commercialization of new products and processes. The Government's role is to remove barriers and create a conducive environment.

Commerce Department Industrial Technology Partnership Program

To facilitate private initiative, I have launched an Industrial Technology Partnership (ITP) program in the Commerce Department to be led by Assistant Secretary Merrifield. This program will provide a framework for large-scale private sector R&D programs capable of competing with foreign "targeted industry" consortia that have focused tens of millions of dollars on R&D. Through the innovative use of R&D limited partnerships, which minimize antitrust concerns, new product and process technology needed by industry can be funded and developed without direct Government intervention.

Dr. Merrifield will be pleased to describe R&D limited partnerships in as much detail as the Subcommittee likes; I will describe their essence. A general partner -- be it a trade association, research institute, college or university, corporate subsidiary, or entrepreneur -- that has the ability to perform R&D or manage the performance of R&D by others, would determine, after consultation with potential end-users, how it can best meet their R&D needs. The general partner would then enter into arms length contracts for the purchase by the end-users of the technology it develops, provided the technology meets pre-set specifications. These contracts

would be used by the general partner to attract funding from individuals, venture capital firms, and other sources of capital, who would become limited partners. The limited partners would bear the financial risk; would share in the financial success; and would receive tax benefits, such as being able to deduct currently expenditures made by the partnership for R&D.

Because of the flexibility of the limited partnership mechanism, R&D can proceed on numerous fronts, thereby reducing the time needed for major breakthroughs. I believe properly used limited partnerships can be an effective alternative to our corporations having to fund R&D from retained earnings, borrowing, or new equity, and could significantly increase the amount of R&D being performed today.

The Commerce Department's role will be to provide guidelines on the R&D limited partnership mechanism, to develop technical and market information for prospective partnerships, and to remove policy barriers to the successful implementation of R&D limited partnerships.

As part of our role, we have established a Center for the Utilization of Federal Technology (CUFT) to license Federally-owned inventions, to provide technical information,

and to aid in identifying Federal technologies that might be developed by R&D limited partnerships. We also plan to hold several workshops on R&D limited partnerships in the near future.

The overall Government role regarding R&D limited partnerships, however, is minor compared with that of the private sector. It is up to the private sector to select and define research programs and technical objectives; to arrange financing; to take advantage of the incentives provided in the tax and investment areas; to perform the R&D; and to commercialize the results.

Other Initiatives

Besides our ITP program, other policy initiatives are underway to help high-growth new technology industries.

We have strengthened the Patent and Trademark Office. Proceeds from recent fee increases are being used to hire needed staff and to speed automation of the patent examining process. We are reducing the backlog of patent applications and speeding up application processing time. We are improving the validity of the patents we issue. I believe

that strong valid patents increase the prospects for the commercial development of inventions.

The Small Business Innovation Research Act, recently signed into law by the President, requires Federal agencies to expend, ultimately 1-1/4 percent of their annual R&D budgets on innovative proposals submitted by small businesses. This new law will make a significant pool of capital available to finance early-stage R&D consistent with Federal agency and national needs.

We have made progress on the commercialization of Government-funded inventions. Existing law gives small businesses and non-profit institutions the right to title to inventions resulting from their performance of Federally-funded R&D. As in the last Congress, we will support amending the law so that all in the private sector, regardless of their size, will have the same rights. Ownership of patent rights in many instances is the key incentive to obtaining risk capital necessary to bring an idea to the marketplace. Under current law we are already observing increases in invention reporting to HHS and NSF -- the primary agencies supporting university-based and non-profit research. In the meantime, until legislation passes, the Government-wide policy will be to give, to the fullest extent allowed by law, all Government

contractors and grantees ownership of inventions arising from their performance of Federally-funded R&D. This policy will be implemented through an Interagency Committee on Intellectual Property, chaired by Assistant Secretary Merrifield. In addition, this Committee will undertake an assessment of patent protection for computer software.

Tax Policy

Earlier, I discussed some of our tax policy initiatives. There may be, and I emphasize the words may be, a need to expand the scope of the existing 25 percent tax credit for qualified incremental research expenditures. We need to evaluate this and other provisions of our tax laws as they apply to R&D and we are starting to do so.

Scientific and Engineering Manpower

Future economic and productivity growth heavily depends on having a sufficient supply of trained scientists and engineers. Scientific and technological literacy are prerequisites even for many non-technological careers associated with high-growth new technology-based industries.

Of concern is the fact that the Nation's pre-college and university education systems are having difficulty in attracting and retaining qualified science and mathematics teachers. Consequently, many high schools do not offer sufficient mathematics to prepare graduates for engineering schools.

At the university level, opportunities for studying engineering are now limited by a shortage of engineering faculty. Noncompetitive salaries, large teaching loads, and lack of the latest research instrumentation and facilities make it difficult for universities to compete with the private sector for technically competent talent.

We must better encourage universities, States and the private sector to address this technical education issue with more urgency. The Administration is exploring a number of possible ways to provide this encouragement, including the establishment of Presidential awards and incentives for excellence in science and mathematics teaching, programs for continuing teacher education in science and mathematics, and university faculty awards in critical disciplines.

National Technology Medal

Because of the importance of technological innovation to the Nation's productivity and international competitiveness, we are developing, in cooperation with the President's Science Advisor, criteria and procedures for awarding National Technology Medals. This award would identify and reward outstanding achievements in bringing research results to the marketplace as well as in developing technical manpower. It would elevate the prestige of technological achievements to the same level as advances in fundamental science and basic research, which we recognize with the National Science Medal.

White House Conference on Productivity

The Administration is continually looking for more ways to enhance our productivity and technological competitiveness. This search relies heavily on listening to members of all sectors of our economy. For example, in accord with the recently enacted White House Conference on Productivity Act, we will be sponsoring a White House Conference on Productivity which will involve leaders of business, labor, academia, and government. The Conference will be aimed at seeking policy proposals for improving our productivity and

technological competitiveness, as well as for stimulating private productivity-improvement initiatives.

Conclusion

Let me conclude with what I see as the pivotal role to be played by American management. The competitive position of American business has not deteriorated because of a lack of Federal Government support. A study by McKinsey and Company estimated that a high percentage of the variables affecting productivity are internal to a company and lie within management's control.

How can American management deal better with those internal variables?

First, for too long American business has emphasized short term results instead of a longer term strategic view. This emphasis, we believe, has resulted in long-term investments, like R&D, being short-changed. One vice-president of research summed it up when he said, "we have been attempting to develop major new systems with ten-year technology, eight-year research programs, a five-year corporate plan, and one-year funding."

As the former chief Executive Officer of a major corporation, I would be the first to admit that it is extremely difficult to plan for a time horizon that could be as long as 20 years. Moreover, it is hard to come up with funds for long-term investment when one is experiencing slow growth. To some the trade-off looks clear -- current profit and cash flow versus uncertain benefits way off in the future. However, the tradeoff for many firms and industries is really temporary profits and cash flow versus opportunities to establish a truly strategic competitive position. The Industrial Technology Partnership program I described is one approach to coming up with the necessary financing.

Second, the days of isolated national markets are over. More and more companies may find it necessary to adopt "global strategies." Harvard Business School professor Michael Porter advises that it may be more appropriate for some multinationals to view the world as one market, instead of as a portfolio of unrelated single-country markets. This could also apply to R&D.

Third, American business may find that R&D on production processes may be as valuable as that on products. The dramatic improvements in productivity brought about by the Japanese development of the kanban system can be worth more

to a company or industry than small modifications in the product itself.

Fourth, management should be thinking more about quality. Quality and productivity tend to go hand in hand. If you produce a higher quality product, you have less rework, less inventory, less warranty and service costs, and less debt to carry.

Finally, management and labor must look at their relationship in a new context. Management must develop a new awareness of -- and respect for -- the underutilized capacities of the American worker. While labor is a cost, of course, it also should be treated as a valuable resource which should be rewarded in part on the basis of its contributions to productivity gains. Similarly, employees must develop a new sense of responsibility for the total production process and the quality of the final product.

Although we are living in a period of remarkable change that presents many risks and dangers, the opportunities for profitable economic growth and employment are unprecedented. We must remind ourselves that the United States has important advantages over all other nations. We have by far the most advanced technology in almost all areas of industrial

enterprise; and we have an incomparable industrial base that is capable of translating new concepts into useful products and processes. We have a unique entrepreneurial culture unmatched anywhere in the world; and we have by far the most efficient capital markets.

The Government's goal is to remove the barriers to, and create a conducive environment for, the effective use of these resources. If, as a Nation, we are successful in using our resources, and I am confident that we will be, the United States will be a major beneficiary of the changes that are occurring throughout the world.

Thank you for asking me to appear before you today.

Senator CHAFEE. Do you have any questions, Ed?

Mr. ZSCHAU. Yes, thank you.

Mr. Secretary, one of the tax policies that has been very helpful, to not only my company in the past but also to other rapidly growing high-technology companies, is the DISC, the Domestic International Sales Corp. I understand that is under attack now and may be altered. What is your position on that?

Secretary BALDRIGE. The DISC, it is claimed by our partners in GATT, is illegal. Now, I don't want to go into all of the background of that, but let us say that we feel that it should be changed.

We have had that up before the Cabinet Council. We have a decision by the President that goes as follows: That when the DISC is to be replaced, it will be replaced by a similar mechanism that is revenue-neutral as far as the Treasury is concerned, so that they don't give out any more or any less than they do now. It will be of the same value to the business community, so that they won't be deprived. And it will not be too onerous on medium- and small-size business—I mean, it will not be so complicated or sophisticated as to put undue hardship on small businesses as compared to large business.

So I think obviously we were strong advocates of that position, and I'm glad to say that the President did make that decision.

Now, at this stage, myself, the Secretary of the Treasury, and the U.S. Trade Representative formed a committee to achieve the President's ends. So we don't have the vehicle yet, but we are working on it. That's the background on it.

Senator CHAFEE. Mr. Secretary, what do you think about the acquisitions we see in this country? Maybe there is not much we can do about them, but when you see these monstrous costs incurred by corporations going off on these frolics to satisfy the egos of their chief executive officers, like the Bendix-Martin Marietta allied caper, what good does that do for this Nation? Is there anything we should do about it? Or are the cures worse than the problem?

Secretary BALDRIGE. Well, I think the cures would be worse than the problem, and to quote an old bromide as far as the problem goes, "Water seeks its own level." I mean, some of those acquisitions have been good; some of them have been miserable, haven't done any good at all and have done harm.

I think American businessmen fully understand that problem, and I think a process of self-correction has already begun. And I think you will see it work in the future.

The base of the problem has been inflation, because inflation has meant that trying to expand yourself by buying new capital equipment, and so forth—inflation rates have forced interest rates in the past up so much that long-term interest rates were prohibited to many companies trying to put up new plant and equipment, so it was just plain cheaper for them to buy existing companies that already had the plant and equipment in place. And the reason for that was the inflationary price that American businesses had to pay. I mean, there is a businesslike reason for wanting to do that.

Now, you do get into ego problems and things like that, mergers that don't make any sense; but basically the reason for the number of acquisitions, as opposed to a company going out and building a new plant itself, has been because it's been flat cheaper to buy

somebody else's stock with a low price to earnings ratio, because it's been too expensive to get long-term credit.

Senator CHAFEE. Well, I agree with you, and I think there is probably little we can do; although I believe there is something we can do as far as eliminating these golden parachutes.

I'm off the subject of these hearings, but I would be interested to get some views from you. These fellows who wish to live by the sword but not die by the sword, are creating ridiculous safety nets for themselves.

What are your views on that?

Secretary BALDRIGE. Well for 20 years I was chief executive officer of a couple of companies and we had some attempted raids in the past, and I never had one of those golden parachutes. So I think that speaks for how I stand on it better than any words could.

But in general I think that's a self-correcting process. There has been a great deal of unfavorable publicity.

Senator CHAFEE. How are they self-correcting? You have captive directors. I believe directors are captives of management in 90 percent of the cases.

So how is this going to correct itself? Management votes these splendid golden parachutes and they go off unscathed.

Secretary BALDRIGE. Well, I think it's self-correcting for the same reason as the first point you brought up about unwise mergers.

If you are going to have a free market system there are going to be some abuses. The abuses get to be known, they become unpopular, people rise up against them, and they stop.

Senator CHAFEE. Well, we are the people. How do we rise up against them?

Secretary BALDRIGE. The directors will. I am not talking about tomorrow morning. In the first place, I didn't take you up on your fact that 90 percent, according to you, of the directors are captives of management. I think that figure—

Senator CHAFEE. Well, maybe it should be 95, but roughly that. [Laughter.]

Secretary BALDRIGE. Well, Senator, I don't agree with you on that, so just let me say it's too prevalent. I agree with the tenor of your remarks, perhaps, that it's too prevalent, but I think that it is changing. But it will not change overnight.

But the publicity and public's perception of the unfairness, that is a correct perception as far as I'm concerned, means that there will be fewer golden parachutes and of less amount handed out in the future than there have been in the past. Directors will take care of it, I'm sure.

Any legislated cure would be worse than the disease.

Senator CHAFEE. That is the difficulty in all these things. I agree with you that trying to do something about it gets us into all kinds of intricacies that cause more harm than the existing situation.

Secretary BALDRIGE. Senator, I was going to say that Senators sometimes have small golden parachutes on some of their prerogatives, but I won't.

Senator CHAFEE. Well, they are tiny parachutes.

Secretary BALDRIGE. They are much smaller.

Senator CHAFEE. Well, Mr. Secretary, I know that you are trameled to some degree by overall administration policy. I suppose you can't come in here and recommend cutting the capital gains rate to 10 percent.

Before you go, is there any other point that you would like to stress?

Secretary BALDRIGE. I don't want this to sound platitudinous, but really the best thing the Government can do is to get out of the way. Government should remove the barriers. And by "barriers" I mean just not trade barriers but tax barriers like you are talking about. I mean, and this is my personal view—and this isn't necessarily the administration's view, obviously, because it gets into matters that the Treasury is involved in—is that heading toward a lower capital gains tax would clearly help the entrepreneur, the new businessman, the people who are willing to invest in a high-risk venture in R&D, and so forth. That is the right path to take.

Now, obviously I can't speak for the Treasury here, but they have to be concerned about our budget deficits. And there is a tenuous line to walk there. But for helping in this area, lowering the capital gains tax would be a big help, just as stock options would.

Senator CHAFEE. Is there a zero capital gain in these other countries?

Secretary BALDRIGE. Well, I don't have the list with me, Senator; but, subject to correction, let me say I don't think there is one in the United Kingdom.

Senator CHAFEE. Do you mean somebody would invest in a company \$1,000; it would grow to \$100,000, they would make a \$99,000 profit and pay no tax?

Secretary BALDRIGE. There are many countries like that. Now, some of them have very high individual tax rates which militates against those gains, but they don't have a capital gains tax rate, or a very small one if they have one at all. So it is not just a one-way street.

Senator CHAFEE. I want to thank you very much for coming, Secretary Baldrige.

Secretary BALDRIGE. Thank you, Senator.

Senator CHAFEE. Dr. Merrifield, can you stay for a few minutes?

Dr. MERRIFIELD. Yes, Senator.

Senator CHAFEE. Thank you, Mr. Secretary.

Secretary BALDRIGE. Thank you.

Senator CHAFEE. Doctor, we are holding these hearings today because of that very interesting talk I heard you give in Rhode Island.

Is there anything that you want to add to the Secretary's testimony?

Dr. MERRIFIELD. I think that we have to remember that we have a very positive situation here in the United States, that in spite of the fact that there are many forces that are operating now worldwide, and will continuously erode some of our older smokestack-type businesses; nevertheless, the same forces are creating unparalleled opportunities, and we are in a better position to take advantage of those than any other country anywhere in the world.

We have by far the most advanced technology of any nation in the world. We have an industrial infrastructure that is unequalled

in terms of depth and breadth and scope in its ability to translate new developments into useful products and processes.

We have a remarkable, entrepreneurial culture which is absolutely unique anywhere in the world.

And, finally, we have the best capital-formation capability.

When we get those elements together, those are resources that are unparalleled, and if we can get those together there isn't anything that we can't do that we would want to put our minds to.

Senator CHAFEE. Well, what do you mean "get them together"? What should we do?

Dr. MERRIFIELD. I think the appropriate roles are two things, two strategies: One is to remove the barriers that are now preventing us from doing some of these things—and I'm speaking now not only of the antitrust laws, which in a targeted-industry world market are basically anticompetitive now and causing us to lose market share, to concentrate businesses, to reduce competition in certain areas, but also—

Senator CHAFEE. The Secretary testified, that this intricate scheme you had was working. I am looking for some specifics. "Get rid of these barriers"—what barriers?

Dr. MERRIFIELD. Well, the R&D limited-partnership concept is one approach which we can begin to operate now. It will allow big companies to collaborate in a way that would not violate the antitrust laws.

But, as you pointed out, it is a very cumbersome process. And as someone who has managed many laboratories simultaneously, those management skills are not easy, and anything that encumbers them further is going to make them more and more difficult.

Senator CHAFEE. Is your Department going to seek changes in the antitrust laws to eliminate these barriers?

Dr. MERRIFIELD. Well, we hope to be able to do so. Again, we have to work with many other people and agencies before we can come forward with proposed amendments. However, we are anxious to find ways to modify the existing law, so they don't operate as anticompetitively for us in world markets.

Senator CHAFEE. It seems to me the thrust has got to come from you folks. After all, you are the Department of Commerce. If the administration wants changes in the antitrust laws, bring them up. Maybe they won't fly, but nothing ventured, nothing gained. If you think it's the best thing to do, proceed. I know that the mere mention of changes in antitrust usually sends up some alarm signals; you and I discussed this before. But, nonetheless, if there is a favorable argument that can be made for changes, particularly in something like R&D, and if the outcome means more jobs for Americans, I think you would find a sympathetic reaction here.

Dr. MERRIFIELD. I hope so. I think it's going to take some time, and that's why in the interim we have taken these other tactics, approaches—namely, the R&D limited partnership is one.

But also, the other side of that coin is increased incentives. For example, there has been an explosion of new venture-capital companies in the last 3 years since the capital gains tax has been reduced. That's really one of the things that has stimulated this enormous explosion of small companies. As Secretary Baldrige has pointed out, there are some 650 of these small venture-capital firms

now that are formed with \$7 billion in assets. I think it grew \$1½ billion last year. And this is a very rapidly developing thing.

That's the type of incentive, I believe, that is very important. And the R&D incremental tax credit unfortunately does not apply to these startup companies, because it has to have a 3-year base line. So it's not as effective, for example, as it might be if it would allow those startup companies to use it as well.

There are lots of different ways in which we can create incentives for the utilization of our tremendous resources, and I think that's what we need to work together to develop.

Senator CHAFEE. You have a special committee on high-tech competition; correct?

Dr. MERRIFIELD. Yes; we have several initiatives here. One of these is what we call our "competitive assessment" program where we analyze industries for the strategic factors that are involved—the incentives that might be put in place, and the barriers that need to be removed.

Senator CHAFEE. When will your recommendations be completed?

Dr. MERRIFIELD. These will be incremental. These will be coming out continuously. For example, we have just completed one on the petrochemical sector; we are close to completing one on the aircraft sector; and then in telecommunications; and then we have a whole bunch of others that are coming out.

Senator CHAFEE. Who are the recommendations available to? Are they public? Do you send them up here?

Dr. MERRIFIELD. Well, they will be; I'm sure.

Senator CHAFEE. You've done one on the petrochemical industry?

Dr. MERRIFIELD. That's correct; yes.

Senator CHAFEE. What has happened with that?

Dr. MERRIFIELD. Well, it's under administrative review right now, and it has not been released publicly yet but presumably it will be released in the future.

Senator CHAFEE. I hope you will proceed and send your recommendations to us. This committee wants to be helpful in this area. Ed?

Mr. ZSCHAU. Dr. Merrifield, on page 15 and 16 of the submitted testimony you refer to a problem that I mentioned in my testimony, the scarcity of trained technical people. We don't have enough engineers coming out to meet the requirements of a high-growth industry.

I notice that most of the suggestions that are proposed on page 16 don't deal with money, they deal with awards or pats on the back.

Is there a reason why you've shied away from either some sort of tax incentives for contributions to universities, or perhaps proposing matching grants to help build our faculty in engineering schools?

Dr. MERRIFIELD. There are many options of this sort, and I think we ought to explore all of them. One of my hopes is that R&D limited partnerships can have a major impact on rehabilitating our university laboratories and facilities, and faculty salaries, and graduate student fellowships, and so forth, as they begin to fund money through the private sector back into the universities. And this is one of the rather attractive features of this.

I can't go into all of the details right now, but if you are interested I will be delighted to do that.

Mr. ZSCHAU. Thank you.

Senator CHAFEE. Thank you very much, Dr. Merrifield. I appreciate your coming.

Dr. MERRIFIELD. Thank you, Senator.

Senator CHAFEE. The next witness will be Mr. Robert Price, President of Control Data, Minneapolis.

Mr. Price, we welcome you.

Mr. PRICE. Thank you.

Senator CHAFEE. Tell us what we can do to help you.

Mr. PRICE. OK.

Senator CHAFEE. And maybe it consists of doing nothing, just getting out of your way.

Mr. PRICE. I don't get many opportunities like that. [Laughter.]

Senator CHAFEE. Please proceed.

STATEMENT MR. ROBERT M. PRICE, PRESIDENT, CONTROL DATA CORP., MINNEAPOLIS, MINN.

Mr. PRICE. My name is Robert M. Price. I am president of Control Data Corp., with headquarters in Minneapolis.

I wish to thank you, Mr. Chairman, for the opportunity to be here today and certainly take the opportunity to commend you for the initiative in conducting hearings on a wide range of policy options for promoting the growth and competitiveness of U.S. high-technology industries. High-technology industries, as I'm sure you've had lots of testimony as well as written material, are a proven engine of job creation; so Federal tax and investment and human capital policies are all critical to enhancing the competitive position of those industries.

There are plenty of others, I am sure—we have heard some of that this morning—who will address these particular issues of tax, investment, and human capital policies in these hearings. There is just no question that those factors are critical and that new initiatives regarding them are needed.

But today I want to devote my remarks to an even more crucial factor, and that is cooperative research and development, for cooperation has a unique potential for protecting and enhancing the competitive position not only of U.S. high-technology industries but also other industries of equal importance to our economy.

Our country's once strong international position in technology has been steadily eroding—that's received lots of publicity—as other countries have taken a number of steps to accelerate their development and application of advanced technology.

For example, in the brief span of a couple of years now, the U.S. position in microelectronics has gone from one of unquestioned and seemingly unassailable leadership to one of considerable questioning and doubt.

The experience of being in second place in worldwide shipments of a particular microelectronic component occurred for the first time. A report by a Government research laboratory raised the possibility that it might be dependent on Japan for supercomputers by the end of this decade. And Japan sponsored an international

ference to announce its intention to become a world leader in computing by 1990.

Well, as all that shows, the greatest progress in advancing and exploiting technology has been made by Japan in targeted industries.

The Japanese Government has promoted cooperation amongst industry members at base technology level as a key strategy for success.

This strategy, particularly as implemented in the areas of microelectronics and computers, poses an ominous threat that has serious implications for virtually all modern industries, and of course, then, by implication, for our national security as well.

That threat is accentuated by the pervasive and rapidly growing application within all industries of the base technologies of microelectronics.

As I indicated, an adequate response to all of this will certainly require a lot of different kinds of actions; however, by far the greatest and most rapid progress can be achieved by increasing our efficiency in developing and applying technology. And given the scarcity of available resources—and by resources I mean not just financial but human resources as well—achievement of such efficiency is just simply going to require a vast increase in technological cooperation. Yet, somehow, intraindustry technological cooperation is a somewhat neglected topic in this ongoing national debate about U.S. industrial policy.

A wasteful duplication of research and development efforts, the use of basic knowledge by one party, just simply shouldn't preclude its use by another. For every corporation to rediscover what others have already learned represents waste not only to each company but also to society. And that's especially valid in the light of a critical shortage of competent scientific and engineering people, which has already been discussed in these hearings this morning.

Well, anyway, my company, Control Data, has been a pioneer in advocating and practicing broad-based cooperation. Our experience in technological cooperation over the past 10 to 15 years has demonstrated not only that such an approach will work but it is essential to the maintenance of a vigorous competitive environment.

Now, recently the need for cooperation in research and development is beginning to be recognized by others. The most significant endeavor in that regard will be launched next month—the Microelectronics & Computer Technology Corp., or MCC as it's referred to.

And MCC is a research and development venture. It will be owned, operated, and managed initially by a number of the companies in the U.S. computer and semiconductor industries.

Participating companies so far include: American Micro Devices, Control Data, Digital Equipment, the Harris Corp., Honeywell, Motorola, National Semiconductor, NCR, RCA, and the Sperry Corp.

MCC represents a cooperative effort to develop a broad base of fundamental technologies.

Senator CHAFEE. Mr. Price, is this an example of what Secretary Baldrige and Secretary Merrifield were discussing?

Mr. PRICE. It is not an R&D partnership, if that's what you mean, along the lines that they were discussing. No, sir, it is

funded entirely by the participants in the organization, and it is looking at long-term projects that go significantly beyond the current state of the art.

The projects will be staffed primarily by personnel who are borrowed from the shareholder companies. And this flow of talent to and from the shareholder companies will be key to the success of the projects.

The problem of technology transfer, of course, rests fundamentally with people. And so that process greatly facilitates the transfer of technologies to the participating companies.

Senator CHAFEE. Do you have antitrust worries as you go into something like this?

Mr. PRICE. Let's put it this way: Control Data has been at this so long that we don't have those kinds of worries, but all of our partners do. [Laughter.]

We have the experience and the benefit of experience, and that gives us confidence as we go ahead, but we recognize the need. I'll come to that in just a moment.

The benefits are of course, to all of us: That we have an expanded scope of R&D to include projects we couldn't undertake alone due to the costs or risks; there is a reduction in the needless duplication of research and development between the companies; a better definition of R&D needs, and some of the pitfalls as well; and, of course, a more efficient utilization of scarce scientific and technical talent.

For convenience, MCC will hold title to all know-how and patents. Although the participating companies will have the initial rights to the technology and receive preferential treatment, the technology will be licensed to other companies on reasonable terms. That is extremely important, for example, to small companies who couldn't undertake such research at all.

MCC therefore will become a significant national technology resource. Each shareholder or licensee of MCC will draw upon the fundamental technologies, they will add value, and then compete in market of their own choosing with products and services of their own design.

So the ultimate beneficiary of that process is of course the whole country, through increased job opportunities and in the expansion of choice of products and services available to consumers.

Well, as you have already anticipated in view of all that, the national and individual benefits, it is a fair question to ask: Why isn't technological cooperation just a way of life in our country? There are two, at least, very important reasons for that.

The first one is our business culture. That culture has evolved over a couple of hundred years now in an environment of a huge and expanding market, a market in which there was almost unlimited resource available and in which competition for most U.S. companies was mainly other U.S. companies.

Some other inhibiting aspects of that business culture are an emphasis on short-term investment horizons—that in itself, of course, is a complex subject—and also a misplaced view of what is involved these days in maintaining a proprietary position.

But our attitudes, those attitudes of that culture, have become anachronistic as the world we live in and the world we compete in

has changed fundamentally over the past decade. And as we have already heard this morning that change is going to accelerate even more over the next 20 years.

That change is not just in the rate of technological change, but it is also in terms of exploding capital intensity and increasing international competition.

Well, the second and more important reason for lack of cooperation in cooperative research and development is the fear of involuntarily or inadvertently violating our century-old antitrust laws.

Many companies, in fact I would say most companies, are deeply concerned that the Justice Department or the courts will interpret "cooperation" to mean "conspiracy" even in something like as basic as research and development, and that therefore they might be exposed to large treble-damage awards.

Now, even though the research consortia are typically completely lawful, the uncertainties in the interpretation and application of U.S. antitrust laws are a major obstacle to pooling resources.

When you get right down to it, very little official guidance exists, either as to what constitutes a lawfully constructed joint research and development venture or what conduct will ultimately be considered lawful by the courts. Thus, participants in cooperative R&D ventures proceed at their peril.

So, Mr. Chairman, we feel strongly that it's time to correct this problem. In order to bring about widespread cooperation we do need a change, and we need a change in the tenor of the current laws, from laws that, if you will, sometimes permit technological cooperation, to legislation that encourages it.

Now, within the last year a number of public elected officials have begun to emphasize the need to remove unnecessary obstacles, but we feel there is an urgent need for Congress to act to clear away the uncertainties in the interpretation and the application of the law.

Several bills were introduced in 1982 that recognized all of this. Among those, S. 3116, which was introduced by Senators Mathias and Hart, embodies the most comprehensive and effective solution.

Now, it's important to note that S. 3116 would not change but simply clarify U.S. antitrust law and its provisions. It calls for an objective set of standards or rules which would be enacted, and according to which the companies desiring to cooperate in research and development could legally plan and implement their activities. Statutory rules would deal with such criteria as the scope and duration of permissible activities, the permissible degree of market share, permissible and impermissible collateral restraints on participants: the question of access to the venture and to the results of its research activities.

Now, of course, any competitive activities falling outside those standards would remain fully subject to the dual deterrents of Government as well as private damage actions.

So, in short, what we can do, what I urge the committee and all of your colleagues in the Senate is to support S. 3116.

Senator CHAFEE. You think S. 3116 is a good measure and would be helpful?

Mr. PRICE. We do.

Senator CHAFEE. Do you know whether hearings have been held in the Judiciary Committee?

Mr. PRICE. The bill was introduced very late in 1982 and is to be reintroduced, so I think no hearings have been held as yet.

In any event, as we've noted, the United States is the acknowledged world leader in computers and microelectronics; but, I can only add, just as we once were in textiles and automobiles and steel. And there are threats to that leadership.

On the other hand, I am convinced—particularly working over the past few years, and especially in the last year or so, with MCC—I am convinced that the stage is set for industry initiatives that will reverse the deterioration of world leadership in technology.

So, given a chance, we will preserve and enhance free-market competition, and at the same time expand employment opportunities, broaden the choices available to our consumers, and strengthen national security.

We truly hope the Congress can begin to adopt the policies that will provide us that opportunity.

Thank you, and I would be happy to answer any questions.

[The prepared statement of Robert M. Price follows:]

R. M. PRICE TESTIMONY
SENATE FINANCE COMMITTEE
JANUARY 19, 1983

MY NAME IS ROBERT M. PRICE, PRESIDENT OF CONTROL DATA CORPORATION, WITH HEADQUARTERS IN MINNEAPOLIS, MINNESOTA. BUSINESSES, INDUSTRIES, EDUCATIONAL INSTITUTIONS, AND GOVERNMENTS THROUGHOUT THE WORLD USE CONTROL DATA COMPUTER SERVICES AND SYSTEMS, PERIPHERAL PRODUCTS, AND FINANCIAL SERVICES.

I WISH TO THANK YOU, MR. CHAIRMAN, FOR THE OPPORTUNITY TO BE HERE TODAY, AND COMMEND YOU FOR YOUR INITIATIVE IN CONDUCTING HEARINGS ON A WIDE RANGE OF POLICY OPTIONS FOR PROMOTING THE GROWTH AND INTERNATIONAL COMPETITIVENESS OF U.S. HIGH TECHNOLOGY INDUSTRIES -- WHICH ARE A PROVEN ENGINE OF JOB CREATION.

FEDERAL TAX, INVESTMENT, AND HUMAN CAPITAL POLICIES ARE ALL CRITICAL TO OUR COMPETITIVE POSITION, AND OTHERS, I AM SURE, WILL ADDRESS THESE ISSUES DURING YOUR HEARINGS. THAT THESE FACTORS ARE CRITICAL AND NEW INITIATIVES REGARDING THEM ARE NEEDED THERE IS NO QUESTION, BUT TODAY I WANT TO DEVOTE MY REMARKS TO AN EVEN MORE CRUCIAL FACTOR: COOPERATIVE RESEARCH

AND DEVELOPMENT. COOPERATION HAS UNIQUE POTENTIAL FOR PROTECTING AND ENHANCING THE COMPETITIVE POSITION OF NOT ONLY U.S. HIGH TECHNOLOGY INDUSTRIES, BUT ALSO OTHER INDUSTRIES OF EQUAL IMPORTANCE TO OUR ECONOMY.

OUR COUNTRY'S ONCE STRONG INTERNATIONAL POSITION IN TECHNOLOGY HAS BEEN STEADILY ERODING AS OTHER COUNTRIES HAVE TAKEN A NUMBER OF STEPS TO ACCELERATE THEIR DEVELOPMENT AND APPLICATION OF ADVANCED TECHNOLOGY. OUR FOREIGN COMPETITORS HAVE GREATLY EXPANDED R & D SPENDING; THEY HAVE DRAMATICALLY INCREASED THE NUMBER OF TRAINED SCIENTIFIC AND TECHNICAL PERSONNEL AVAILABLE TO THEM; THEY HAVE REDUCED THE COST OF CAPITAL TO THEIR KEY INDUSTRIES; AND THEY HAVE AVOIDED WASTEFUL DUPLICATION OF TECHNOLOGY DEVELOPMENT.

IN THE BRIEF SPAN OF TWO YEARS, THE U.S. POSITION IN MICROELECTRONICS HAS GONE FROM ONE OF UNQUESTIONED AND SEEMINGLY UNASSAILABLE LEADERSHIP TO ONE OF CONSIDERABLE QUESTIONING AND DOUBT. THE EXPERIENCE OF BEING IN SECOND PLACE IN WORLD-WIDE SHIPMENTS OF A PARTICULAR ADVANCED MICROELECTRONIC COMPONENT -- THE 64K RANDOM ACCESS MEMORY CHIP -- OCCURRED FOR THE FIRST TIME; A REPORT BY A GOVERNMENT RESEARCH LABORATORY RAISES THE POSSIBILITY THAT IT MAY BE DEPENDENT ON JAPAN FOR SUPER COMPUTERS BY THE END OF THIS DECADE; JAPAN HAS SPONSORED AN INTERNATIONAL CONFERENCE TO

ANNOUNCE ITS INTENTION TO BECOME THE WORLD LEADER IN COMPUTING BY 1990; MEANWHILE, IT ALREADY DOMINATES IN THE AREA OF LOW COST PRINTERS AND THREE INCH MAGNETIC DISK DRIVES, BOTH OF WHICH ARE TIED TO THE EXPLODING PERSONAL COMPUTER MARKET.

AS THESE DEVELOPMENTS SHOW, THE GREATEST PROGRESS IN ADVANCING AND EXPLOITING TECHNOLOGY HAS BEEN MADE BY JAPAN IN TARGETED INDUSTRIES, WHERE THE JAPANESE GOVERNMENT HAS PROMOTED COOPERATION AMONG INDUSTRY MEMBERS AT THE BASE TECHNOLOGY LEVEL AS A KEY STRATEGY FOR SUCCESS. THIS STRATEGY, PARTICULARLY AS IMPLEMENTED IN THE AREAS OF MICROELECTRONICS AND COMPUTERS, POSES AN OMINOUS THREAT THAT HAS SERIOUS IMPLICATIONS FOR VIRTUALLY ALL MODERN INDUSTRIES, AND BY IMPLICATION FOR OUR NATIONAL SECURITY, BECAUSE OF THE PERVASIVE AND RAPIDLY GROWING APPLICATION WITHIN ALL INDUSTRIES OF THESE BASE TECHNOLOGIES. THIS IS WHY COOPERATION IN U.S. RESEARCH AND DEVELOPMENT IS UNQUESTIONABLY IN THE NATIONAL INTEREST.

AN ADEQUATE RESPONSE WILL REQUIRE MANY AND VARIED ACTIONS. HOWEVER, BY FAR THE GREATEST AND MOST RAPID PROGRESS CAN BE ACHIEVED BY INCREASING OUR EFFICIENCY IN DEVELOPING AND APPLYING TECHNOLOGY. AND GIVEN THE SCARCITY OF AVAILABLE RESOURCES -- BOTH HUMAN AND FINANCIAL -- ACHIEVEMENT OF SUCH EFFICIENCY WILL REQUIRE A VAST INCREASE IN TECHNOLOGICAL COOPERATION. YET INTRA-INDUSTRY TECHNOLOGICAL COOPERATION IS A BADLY NEGLECTED TOPIC IN THE ON-GOING NATIONAL DEBATE ABOUT U.S. INDUSTRIAL POLICY.

THE U.S. IS SUFFERING FROM A WASTEFUL DUPLICATION OF RESEARCH AND DEVELOPMENT EFFORTS. THE USE OF BASIC KNOWLEDGE BY ONE PARTY SHOULD NEVER PRECLUDE ITS USE BY ANOTHER. FOR EVERY CORPORATION TO REDISCOVER WHAT OTHERS HAVE ALREADY LEARNED REPRESENTS WASTE -- NOT ONLY TO EACH COMPANY -- BUT ALSO TO SOCIETY. THIS IS ESPECIALLY VALID IN LIGHT OF OUR CRITICAL SHORTAGE OF COMPETENT SCIENTIFIC AND ENGINEERING TALENT. THE USSR GRADUATES THREE TIMES AS MANY ENGINEERS AS THE U.S., AND JAPAN, WITH HALF OUR POPULATION, 5,000 MORE ELECTRICAL ENGINEERS.

CONTROL DATA HAS BEEN A PIONEER IN ADVOCATING AND PRACTICING BROAD-BASED COOPERATION FOR YEARS. WE ARE TODAY PARTICIPATING IN FIVE CONSORTIUM ORGANIZATIONS, INCLUDING MAGNETIC PERIPHERALS, INC., IN WHICH FIVE COMPANIES PARTICIPATE TO PRODUCE A LINE OF MAGNETIC MEMORIES FOR INPUT TO AND OUTPUT FROM COMPUTERS.

OUR EXPERIENCE IN TECHNOLOGICAL COOPERATION OVER THE PAST TEN TO FIFTEEN YEARS HAS DEMONSTRATED THAT SUCH AN APPROACH NOT ONLY WILL WORK -- BUT THAT IT IS ESSENTIAL TO THE MAINTENANCE OF A VIGOROUS COMPETITIVE ENVIRONMENT.

COMPANIES IN HIGH TECHNOLOGY INDUSTRIES HAVE PRACTICED LIMITED FORMS OF COOPERATION OVER THE YEARS. CROSS-LICENSING OF PATENTS IS COMMON AND TECHNOLOGY EXCHANGE AGREEMENTS ARE NOT UNUSUAL. AND JOINT VENTURES AMONG TWO OR THREE COMPANIES,

MAINLY SHORT-LIVED, HAVE PROVEN TO BE USEFUL. BUT NONE OF THESE EXAMPLES ADEQUATELY ADDRESSES THE DUAL NEEDS FOR LARGE-SCALE EFFORTS ALONG WITH A MINIMIZATION OF WASTEFUL DUPLICATION IN THE USE OF TECHNICAL RESOURCES.

RECENTLY THE NEED FOR COOPERATION IN R & D IS BEGINNING TO BE RECOGNIZED BY OTHERS. THE MOST SIGNIFICANT ENDEAVOR IN THIS REGARD WILL BE LAUNCHED NEXT MONTH. THE "MICROELECTRONICS AND COMPUTER TECHNOLOGY CORPORATION," (MCC), A RESEARCH AND DEVELOPMENT VENTURE WILL BE OWNED, OPERATED, AND MANAGED INITIALLY BY A NUMBER OF COMPANIES IN THE U.S. COMPUTER AND SEMICONDUCTOR INDUSTRIES. PARTICIPATING COMPANIES SO FAR INCLUDE ADVANCED MICRO DEVICES, CONTROL DATA, DIGITAL EQUIPMENT CORPORATION, HARRIS, HONEYWELL, MOTOROLA, NATIONAL SEMICONDUCTOR, NCR, RCA, AND SPERRY.

MCC REPRESENTS A COOPERATIVE EFFORT TO DEVELOP A BROAD BASE OF FUNDAMENTAL TECHNOLOGIES FOR USE BY MEMBERS WHO WILL EACH ADD THEIR OWN VALUE AND CONTINUE TO COMPETE WITH PRODUCTS AND SERVICES OF INDIVIDUAL CONCEPTION AND DESIGN.

MCC WILL UNDERTAKE PROJECTS THAT WILL GO SIGNIFICANTLY BEYOND CURRENT STATE-OF-THE-ART. INITIALLY, FOUR PROJECTS HAVE BEEN IDENTIFIED, LASTING FROM FIVE TO TEN YEARS:

- O ADVANCED COMPUTER ARCHITECTURE
- O COMPUTER-AIDED DESIGN AND MANUFACTURING
- O SYSTEM AND CHIP PACKAGING TECHNIQUES
- CONTINUING RESEARCH

MCC PROJECTS WILL BE STAFFED TO A CONSIDERABLE EXTENT BY PERSONNEL "LOANED" FROM SHAREHOLDER COMPANIES. THIS FLOW OF TALENT TO AND FROM SHAREHOLDER COMPANIES WILL BE KEY TO THE SUCCESS OF MCC PROJECTS. IN ADDITION, THIS PROCESS GREATLY FACILITATES THE TRANSFER OF TECHNOLOGIES TO PARTICIPATING COMPANIES.

THE BENEFITS TO MCC SHAREHOLDER COMPANIES INCLUDE:

- O AN EXPANDED SCOPE OF R & D TO INCLUDE PROJECTS THAT INDIVIDUAL COMPANIES COULD NOT OR WOULD NOT UNDERTAKE ALONE DUE TO THE COSTS AND RISKS INVOLVED;
- O A REDUCTION IN THE WASTEFUL DUPLICATION OF R & D;
- O A LOWER RATIO OF INVESTED CAPITAL TO SPECIFIC RESEARCH AND DEVELOPMENT RESULTS;
- O A BETTER DEFINITION OF R & D NEEDS AND PITFALLS; AND
- O A MORE EFFICIENT UTILIZATION OF SCARCE SCIENTIFIC AND TECHNICAL TALENT.

FOR CONVENIENCE, MCC WILL HOLD TITLE TO ALL KNOW-HOW AND PATENTS. ALTHOUGH PARTICIPATING COMPANIES WILL HAVE INITIAL RIGHTS TO THE TECHNOLOGY AND RECEIVE PREFERENTIAL TREATMENT, THE TECHNOLOGY WILL BE LICENSED TO OTHER COMPANIES ON

REASONABLE TERMS. THIS IS EXTREMELY IMPORTANT FOR EXAMPLE TO SMALL COMPANIES -- A MAJOR SOURCE OF INNOVATION AND JOB CREATION.

MCC, THEREFORE, WILL BECOME A SIGNIFICANT NATIONAL TECHNOLOGY RESOURCE. EACH SHAREHOLDER OR LICENSEE OF MCC WILL DRAW UPON ITS FUNDAMENTAL TECHNOLOGIES, ADD VALUE, AND COMPETE IN MARKETS OF ITS OWN CHOOSING WITH PRODUCTS AND SERVICES OF ITS OWN DESIGN. THE ULTIMATE BENEFICIARY OF THIS PROCESS IS THE WHOLE COUNTRY THROUGH INCREASED JOB OPPORTUNITIES AND THE EXPANSION IN THE CHOICE OF PRODUCTS AND SERVICES AVAILABLE TO INDIVIDUAL CONSUMERS.

IN VIEW OF THE NATIONAL AND INDIVIDUAL BENEFITS JUST PRESENTED, WHY ISN'T TECHNOLOGICAL COOPERATION A WAY OF LIFE FOR US?

THERE ARE AT LEAST TWO VERY IMPORTANT REASONS:

THE FIRST IS OUR BUSINESS CULTURE, WHICH EVOLVED IN AN ENVIRONMENT OF A HUGE AND EXPANDING DOMESTIC MARKET, IN WHICH COMPETITION FOR MOST U.S. CORPORATIONS WAS MAINLY WITH OTHER U.S. COMPANIES. OTHER INHIBITING ASPECTS OF THIS BUSINESS CULTURE ARE AN EMPHASIS ON SHORT-TERM INVESTMENT HORIZONS -- IN ITSELF A COMPLEX SUBJECT -- AND A MISPLACED VIEW OF WHAT IS INVOLVED IN MAINTAINING A PROPRIETARY POSITION. BUT OUR

ATTITUDES HAVE BECOME ANACHRONISTIC AS THE WORLD WE LIVE IN -- AND COMPETE IN -- HAS CHANGED FUNDAMENTALLY IN THE LAST DECADE. SUCH CHANGE WILL ACCELERATE EVEN MORE OVER THE NEXT 20 YEARS, NOT ONLY IN TERMS OF THE RATE OF TECHNOLOGICAL CHANGE, BUT ALSO IN TERMS OF EXPLODING CAPITAL INTENSITY AND INCREASING INTERNATIONAL COMPETITION.

JAPAN, FOR EXAMPLE, HAS ADJUSTED TO THE NEW REALITIES DIFFERENTLY THAN THE U.S. -- AND I SUGGEST THAT PERHAPS THE MOST IMPORTANT DIFFERENCE WAS THE DEVELOPMENT OF A JAPANESE TRADITION OF COOPERATION IN DEVELOPING AND EXPLOITING BASE TECHNOLOGIES.

THE SECOND AND MORE IMPORTANT REASON FOR THE LACK OF COOPERATION IN U.S. RESEARCH AND DEVELOPMENT, HOWEVER, IS THE FEAR OF INADVERTENTLY VIOLATING OUR CENTURY-OLD ANTITRUST LAWS. MANY COMPANIES ARE DEEPLY CONCERNED THAT THE JUSTICE DEPARTMENT OR THE COURTS WILL INTERPRET "COOPERATION" TO MEAN "CONSPIRACY" -- EVEN IN R & D -- AND, THEREFORE, WILL BE EXPOSED TO LARGE TREBLE DAMAGES AWARDS.

EVEN THOUGH RESEARCH CONSORTIA ARE TYPICALLY COMPLETELY LAWFUL, THE UNCERTAINTIES IN THE INTERPRETATION AND APPLICATION OF U.S. ANTITRUST LAWS ARE A MAJOR OBSTACLE TO POOLING RESOURCES IN RESEARCH AND DEVELOPMENT. VERY LITTLE OFFICIAL GUIDANCE EXISTS

AS TO EITHER WHAT CONSTITUTES A LAWFULLY-STRUCTURED JOINT R & D VENTURE OR WHAT CONDUCT WILL ULTIMATELY BE CONSIDERED LAWFUL BY THE COURTS, IF CHALLENGED.

THUS, PARTICIPANTS IN COOPERATIVE R & D VENTURES MUST PROCEED AT THEIR PERIL.

WE, THEREFORE, HAVE A NEW AND FIERCELY COMPETITIVE INTERNATIONAL ENVIRONMENT IN WHICH FOREIGN GOVERNMENTS HAVE EXPRESSLY STATED THEIR INTENT TO ECLIPSE THE U.S. TECHNOLOGICAL ADVANTAGE -- AN ENVIRONMENT THAT DEMANDS INCREASED COOPERATION IN R & D. BUT A COMPANY INTERESTED IN COOPERATION IS DETERRED BY AMBIGUITY, UNCERTAINTY AND GREAT RISK, ALL ARISING OUT OF ANTITRUST LAWS ENACTED IN THE ECONOMIC CONTEXT OF THE 19TH CENTURY!

MR. CHAIRMAN, IT IS TIME TO CORRECT THIS PROBLEM. IN ORDER TO BRING ABOUT WIDESPREAD COOPERATION, WE NEED A CHANGE IN THE TENOR OF CURRENT LAWS -- FROM LAWS THAT SOMETIMES PERMIT TECHNOLOGICAL COOPERATION -- TO LEGISLATION THAT ENCOURAGES IT. WITHIN THE LAST YEAR, A NUMBER OF PUBLIC AND ELECTED OFFICIALS HAVE BEGUN TO EMPHASIZE THE NEED TO REMOVE UNNECESSARY OBSTACLES TO COOPERATION IN R & D. WE HAVE NOTED VERY ENCOURAGING STATEMENTS BY COMMERCE SECRETARY BALDRIGE, SPECIAL TRADE REPRESENTATIVE BROCK, AND COMMERCE UNDERSECRETARY

OLMER ABOUT THE DETERRENT EFFECT OF ANTITRUST LAWS. AND PRESIDENT REAGAN'S NATIONAL ADVISORY COUNCIL ON PRODUCTIVITY HAS RECENTLY RECOMMENDED THAT THE ADMINISTRATION REVIEW THE APPROPRIATENESS OF CURRENT ANTITRUST LAWS AND PRACTICE FOR COOPERATIVE R & D IN THE NEW INTERNATIONAL ENVIRONMENT.

BUT THERE IS AN URGENT NEED FOR CONGRESS TO ACT TO CLEAR AWAY THE UNCERTAINTIES IN THE INTERPRETATION AND THE APPLICATION OF THE LAW IN THE CASE OF JOINT R & D VENTURES. SEVERAL BILLS WERE INTRODUCED IN 1982 WHICH RECOGNIZE THE SHORTCOMINGS I HAVE DESCRIBED.

AMONG THESE, S.3116, INTRODUCED BY SENATORS MATHIAS AND HART, EMBODIES THE MOST COMPREHENSIVE AND EFFECTIVE SOLUTION. IT IS IMPORTANT TO NOTE THAT S.3116 WOULD CLARIFY, NOT CHANGE, U.S. ANTITRUST LAWS. UNDER ITS PROVISIONS, CONGRESS WOULD PRESCRIBE STATUTORY CRITERIA FOR LAWFULLY ORGANIZING AND CONDUCTING JOINT R & D VENTURES WHICH, IF MET, WOULD SHIELD A VENTURE FROM ANTITRUST ATTACK. A SET OF OBJECTIVE STANDARDS OR RULES WOULD BE ENACTED ACCORDING TO WHICH THOSE COMPANIES DESIRING TO COOPERATE IN R & D COULD LEGALLY PLAN AND IMPLEMENT THEIR ACTIVITIES. STATUTORY RULES WOULD DEAL WITH SUCH CRITERIA AS THE SCOPE AND DURATION OF PERMISSIBLE ACTIVITIES; THE PERMISSIBLE DEGREE OF MARKET SHARE; PERMISSIBLE AND IMPERMISSIBLE COLLATERAL RESTRAINTS ON PARTICIPANTS; AND THE

QUESTION OF ACCESS TO THE VENTURE AND TO THE RESULTS OF RESEARCH ACTIVITIES. OF COURSE, ACTIVITIES FALLING OUTSIDE OF THE STANDARDS WOULD REMAIN FULLY SUBJECT TO THE DUAL DETERRENTS OF GOVERNMENTAL AND PRIVATE DAMAGE ACTIONS.

I URGE THE COMMITTEE AND YOUR COLLEAGUES IN THE SENATE TO SUPPORT S.3116, WHICH WE AT CONTROL DATA CONSIDER TO BE A DEMONSTRABLY WORTHY LEGISLATIVE INITIATIVE.

RIGHT NOW, THE U.S. IS THE ACKNOWLEDGED WORLD LEADER IN COMPUTERS AND MICROELECTRONICS, JUST AS WE ONCE WERE IN TEXTILES, AUTOS, AND STEEL. BUT THERE ARE GRAVE THREATS TO THAT LEADERSHIP TODAY. I AM CONVINCED, HOWEVER, THAT THE STAGE IS SET FOR INDUSTRY INITIATIVES THAT WILL REVERSE THE DETERIORATION OF WORLD LEADERSHIP IN TECHNOLOGY. GIVEN A CHANCE, WE WILL PRESERVE AND ENHANCE FREE-MARKET COMPETITION WHILE EXPANDING THE EMPLOYMENT OPPORTUNITIES OF OUR CITIZENS, BROADENING THE CHOICES AVAILABLE TO OUR CONSUMERS, AND STRENGTHENING OUR NATIONAL SECURITY.

WE HOPE THIS CONGRESS CAN BEGIN TO ADOPT THE POLICIES THAT WILL INSURE U.S. TECHNOLOGICAL PRE-EMINENCE AND THEREBY PROVIDE GROWING JOB OPPORTUNITIES FOR YEARS TO COME.

THANK YOU. I WOULD BE HAPPY TO RESPOND TO YOUR QUESTIONS.

Senator CHAFEE. Thank you, Mr. Price. We appreciate your testimony. You certainly are a leader in this field.

I think what you said on page 3 is pretty ominous:

The Japanese Government has promoted cooperation among industry members on the base technology level. This strategy poses an ominous threat, has serious implications for virtually all modern industries, and by implication for our national security, because of the pervasive and rapid growth.

You have really laid it on the line.

So I hope we can get on with the legislation of Senators Mathias and Hart. I will certainly look into it and encourage others to do the same.

You have restricted your testimony to the joint R&D ventures and the antitrust problems that they raise. Is there anything else you would like to touch on?

Mr. PRICE. The thing that I would like to touch on is to thank you for the R&D tax credit legislation that was passed in 1981. That has been helpful.

Senator CHAFEE. I want to give credit where credit is due; Senator Danforth was primarily responsible for that. Have you used it? Has it been helpful?

Mr. PRICE. We have used it. I think it has been particularly helpful in a down economy, because R&D budgets are always under a great deal of pressure, and having some relief in the tax area helps to protect—if not to expand R&D, at least it has helped protect maintaining an R&D level. It has been helpful. Yes, sir.

Senator CHAFEE. When you deal with consortia like MCC, can you still take advantage of the R&D tax credit?

Mr. PRICE. Yes. It has to be constructed in a contractual form between the participants and MCC; but, we can structure that so that the expenditures of MCC are construed as current research and development expenditures.

Senator CHAFEE. If you had a wish list, what would it be? [Laughter.]

Mr. PRICE. Well, I must say we have concentrated our efforts, particularly in my company and in efforts such as MCC, in trying to see what we can do for ourselves and not continually come down here and ask you what you can do for us. So our wish list is fairly short.

Senator CHAFEE. How about stock options? Is that a big item with your company?

Mr. PRICE. I think stock options is extremely in any high-technology company. It is in ours today, and of course it was a crucial factor 25 years ago when Control Data started up from nothing. It was a crucial factor in attracting people to our company. You know, we had \$600,000 in capital, and that wasn't very much to begin a super-computer company on. Today it's \$4.25 billion dollars. And many of the people who helped fuel that success came because of their ability to participate in stock options.

Mr. ZSCHAU. Mr. Price, you have mentioned that you have had several cooperative activities, and the MCC is just the latest of these. I am familiar with one very successful one, Magnetic Peripherals.

Mr. PRICE. Yes.

Mr. ZSCHAU. In all of these cooperatives has the Justice Department ever said anything threatening or near threatening? Have you had any reason to be afraid that they might view these cooperative ventures as a violation of antitrust law?

Mr. PRICE. Yes. I mean, the whole tenor of the thing is that it's up to you, the participant, to prove that you aren't in some kind of illegal conspiracy as opposed to a supportive atmosphere. I don't say that pejoratively; I think the Justice Department, as well as all of us, simply live in a world of confusion with regard to antitrust. They do the best they can, given the legislation that they have.

And the Rule of Reason, as it's called, is very difficult to interpret. Even the courts don't agree. We even get 5-to-4 decisions in the Supreme Court. So it's confusing for everyone. I think the Justice Department does the best they can with what they've got. I will have to confess that from time to time they seem to enjoy the ambiguity that the law has; but nevertheless, I think everyone is simply doing the best they can. But in a litigious society there is a tendency to hold back; there just has to be.

Mr. ZSCHAU. So even though you have overcome this concern—you said you were completely confident—you are not in a position to say to everybody else, "Come on in, the water's fine: no problem," because you have had indications that it may not be as fine as they would like it.

Mr. PRICE. That's right. We say that, but we say that from the confidence of having charted those waters before, and not because we have any kind of assurances. We are just confident we can overcome obstacles as they occur; and, besides, we know it's got to be done, so it's up to someone to take a little bit of a risk.

Senator CHAFEE. You certainly are an intrepid sailor. The expenses of a suit with the Justice Department are astounding. While you may win in the end, it costs you \$3 million-plus just to defend yourself.

Mr. PRICE. I can't say anything to that except Amen. That's absolutely true—it's the threat of the suit, not the outcome; the actual cost and experience of having to go through it, even if you win, which deters people.

Mr. ZSCHAU. I was just going to say the statement that you made points out the need for this legislation you are talking about. It's not superfluous.

You said that everything that has been done is completely lawful, but that is subject to interpretation.

Mr. PRICE. And as it goes forward of course, as the Justice Department has noted, each individual project of MCC is subject to individual scrutiny. So you have no guarantee ever. You live from day to day.

Mr. ZSCHAU. Thank you.

Senator CHAFEE. You are a targeted industry of the Japanese. They are pouring all kinds of resources into this area which they want to win. Without revealing company secrets, are there any other actions you can take, and/or the Government can take, to be helpful?

Mr. PRICE. Well, there is a whole set of actions that of course need to be taken with regard to maybe what goes under a broad title of "Fair Trade" these days. We don't have any problem com-

peting with the Japanese one-on-one with a company. What we have a problem competing with is the whole country.

So the access to the Japanese markets has received lots of attention, but I think equal and fair trade is an enormously important aspect of this whole thing for the United States, and not protectionism, obviously.

Senator CHAFEE. But outside of the bilateral relationship—in other words, you being able to go into Japan versus their freedom to come here—is there any other thing you are referring to? You say “Fair Trade,” as it were. Are you kept out of other markets?

Mr. PRICE. Well, there are some of those things that of course do affect what we are able to do—and that fundamentally comes back to Government subsidies of exports.

The important markets of the future, the most important markets of the future for all of us, are probably the developing countries. And there, of course, Japan has made a concerted effort to get into those markets. And in many instances they are helped in that by Government financing or subsidies.

Well, I guess the attitude we take about that is that we can't change the laws of Japan. I mean, that's up to them. But we can in fact do what we can to strengthen U.S. industry. So export incentives, the Export Trading Company Act, that was likewise an excellent move to try to help U.S. companies export.

Our whole financial structure is based on a different structure than are the Japanese companies who are primarily financed by debt.

Senator CHAFEE. Will you go into an export trading company?

Mr. PRICE. We have a trading company. We have had one for a number of years, Senator. Yes.

Senator CHAFEE. Will that legislation help you?

Mr. PRICE. That legislation will probably mean that a consortia can be put together, including banks, and therefore you can get resources put together to promote exports, especially for small business.

Control Data is participating in another cooperation, a consortia that came about as a result of our initiative by the Minnesota Business Partnership. It is called MITCO, Midwest International Trading Co., which is an export trading company, which includes several of the Midwest banks. And through that vehicle of course, we hope to help the exports from the Midwest particularly, and for small business particularly, in that part of the country.

So that type of legislation has helped us.

We can't change everything that the Japanese do, and shouldn't even try to, and we certainly shouldn't agonize over it. But we can do things that draw on our own strengths.

We have tremendous entrepreneurial ability in the United States; we have tremendous technological capability that is not just through things like cooperation but by having large companies work with small companies cooperatively instead of gobbling them up. By having Government technology more accessible, in fact by looking at cooperative ventures and promoting technology transfer in all directions we can do a great deal to tap into the basic entrepreneurial spirit and capabilities that we have.

Senator CHAFEE. Do you sell your equipment in Japan?

Mr. PRICE. Yes, sir, we do.

Senator CHAFEE. Thank you very much, Mr. Price. You certainly represent a wonderful company and have been very helpful with your testimony here.

Mr. PRICE. Thank you very much.

Senator CHAFEE. Thank you.

Our next panel includes George Gilder, program director for the International Center for Economic Policy Studies, a noted author; and Eliot Janeway, a noted economist.

Gentlemen, why don't we start off alphabetically. Mr. Gilder?

STATEMENT OF GEORGE F. GILDER, PROGRAM DIRECTOR, MANHATTAN INSTITUTE FOR POLICY STUDIES, TYRINGHAM, MASS.

Mr. GILDER. Thank you very much, Senator Chafee.

Senator CHAFEE. It's nice to have you here. I appreciate your coming down from Tyringham.

Mr. GILDER. Although I am not actually working directly for the Manhattan Institute at the moment, because I'm just finishing a book on high-technology entrepreneurship.

Senator CHAFEE. Please give us a preview.

Mr. GILDER. One facet of it is the capital gains tax in various countries. It might interest you, in answer to your question to Secretary Baldrige, that the long-term capital gains tax rate on equities is zero in Australia, zero in Belgium, zero in Germany, zero in Italy, zero in Japan, zero in the Netherlands. And even the short-term capital gains tax is zero in Belgium, 15 percent in France, zero in Italy, zero in Japan, and zero in the Netherlands.

A lot of people don't see any particular interest in taxing capital gains, particularly when in an inflationary period a very small capital gains tax rate translates to a tax rate of more than 100 percent of all real capital gains. And we have been taxing more than 100 percent of all net real capital gains in the American economy for a decade or so now.

Even at low rates most of the gains are in fact spurious, so that any tax rate—

Senator CHAFEE. Do you mean because of inflation?

Mr. GILDER. Yes; because of inflation.

I would like to tell a short story, though, if I could, which is a happy and inspiring story with an important lesson, and which is relevant to your concerns.

It's a story about the 64K random access memory [RAM], which is perhaps the most important single product in the history of the semiconductor industry. It's that microelectronic product which last year the Japanese made such impressive gains in selling.

It's a product into which the British Government invested some \$200 million; the French Government through its \$4 billion Plan Calcul probably invested several hundred million; and the Japanese invested the famous \$400 million.

Last week one company announced an amazing breakthrough in 64K RAM products, and it was not a company in Japan, France, or Britain. It was not even one of the major American companies. It was a startup some 3 years ago in Boise, Idaho, called Micron Technology. It was not supported by even the major venture capital

sources. It certainly had no backing from government of any sort. It was financed instead by the largest potato farmer in America, together with one of the largest sheep farmers.

This company just has produced a 64K RAM chip that is half the size of the chips that are produced by the average Japanese 64K RAM producer. This immediately makes micron both massively the cost leader in the entire world and the technology leader. It brings the frontiers of this particular technology back to the United States, and specifically to a small company in Idaho supported by potato farmers and sheep farmers.

Now, the source of this breakthrough is important to understand. It is disposable personal savings, and disposable personal savings are what makes entrepreneurship work.

The way to promote disposable personal savings is quite simple—you cut tax rates on personal income. Now, this seems to be difficult in the current environment. People are ululating across the country about the potential deficits, which economists have never in the world ever predicted correctly.

But the fact is, when you cut tax rates on personal income a delightful thing happens. In those brackets where you actually cut the tax rate, both savings drastically increase and Government revenues rise.

This is not a supply-side myth; we have just demonstrated it last year. I will give you the good news quickly, then I can defer to Mr. Janeway.

Last year the top rate was cut from 70 to 50, and the capital gains tax was cut from 28 to 20. As a result, both the Congressional Budget Office and OMB predicted major declines in nonwithheld tax payments. These are quarterly estimated tax payments, chiefly on the incomes of the rich. They are the ones who make estimated tax payments.

OMB said these receipts would drop from \$76 billion in the 1981 fiscal year, before the tax cuts, to \$72 billion in 1982. In other words, a drastic drop was predicted by OMB.

The results are now in for fiscal 1982. Tax payments by the rich rose to \$85.1 billion. That's almost 20 percent more than OMB predicted, and it's 11 percent higher than in 1981 before these tax cuts.

The lower brackets, you know, didn't get any tax cut in 1981. The tax cuts in the lower brackets were overwhelmed by the increases in Social Security taxes and bracket creep.

So the only place where you really had a major tax cut in 1981, you had a drastic increase in tax payments. The result was, tax payments by the rich rose from 27 to 29 percent of total receipts during this period, because in brackets where taxes were increased revenues were significantly lower than anticipated.

So my answer to the interrelated problems of entrepreneurship, savings, and the deficit is the flat rate tax. I think this would be a dramatic benefit for the entire economy and particularly for those entrepreneurial companies which create 80 percent of the net new jobs in America and also contribute very substantially to the crucial new technologies.

Even in the hardest technological challenge faced in the world in the last 5 years, and that was the 64K RAM, even in that product,

which everybody agreed had to require huge Government subsidies, huge Government programs, or at least huge company outlays, it was Micron—a company that spent one-fifth as much as any of the big companies that actually produced the best product, which today leads the world.

Thank you very much.

Senator CHAFEE. When you talk of the flat-rate tax, are your words exact? Are you saying a "flat rate tax" which will be the same for everybody, without deductions, credits, exemptions? Or would it be a graduated flat-rate tax?

Mr. GILDER. Whatever you can get. [Laughter.]

I mean, anything is better than a 50-percent rate, that's all. You just have to fight to get those rates down. They drive people into tax shelters; they institutionalize savings in ways that are not available for startups. You know, you can do anything with an IRA except put it in a small business.

Incidentally, all the possible benefits that might have been enacted for small business or contemplated for them are nullified by social security tax increases. They are a direct penalty for small business. This is overwhelmingly the biggest tax on small business. It is overwhelmingly the biggest tax on jobs. If you want to have fewer jobs, raise the social security tax. It is absolutely automatic and demonstrable, not only in the United States but Germany, France, Britain—it doesn't matter where. This is a direct tax on employment. To the extent that you raise it, you reduce jobs, just automatically. And you reduce small business activity.

But I think that the best thing to do is to bring down income tax rates. A flat-rate tax would be best, but there are all sorts of things you can do. It is going to be a political process, I understand. But, you know, the Bradley bill is a vast improvement on what we've got.

Senator CHAFEE. What about if there would not be, for example, reductions in the personal income tax? Would you seek changes in the capital gains tax?

I know you'll take anything you can get, anywhere, but do you see—it seems to me if you are stalking venture capital—

Mr. GILDER. Yes. I think the capital gains tax is important, and I would like to have that reduced; but I think it is more important to stop taxing interest income, for example, at 50 percent. That is income on disposable personal savings. Most other countries don't do it. It hikes up interest rates, it accounts for the fact that we have the highest real interest rates of any country. It is a major problem of the economy that we continue to tax interest as if it was real, when most of it is inflation, and still is today.

This is a major problem that reduces savings—these disposable personal savings which finance American industry.

You know you can analyze the performance of the whole range of American companies in terms of capital intensity, and the industries which are most capital-intensive do worst, the industries that are most knowledge-intensive do best, because you haven't figured out any way to tax knowledge yet.

So knowledge industries have thrived and have contributed most to our balance of payments. Capital-intensive industries are failing. I don't think this is a necessary and inevitable process. I think if

we had more capital, we could do better in capital-intensive industries.

Senator CHAFEE. I don't see how you increase your revenue from cutting the capital gains tax if you get the capital gains tax to zero.

Mr. GILDER. You would, because you would get a lot more jobs and a lot more incomes all through the economy. It's small companies that grow fastest and create the most jobs and contributed 80 percent of all the net new jobs generated in the 1970's, so you would improve revenues altogether.

However, if I had to choose between a flat-rate tax in general and eliminating the capital gains tax, I'd choose the flat-rate tax.

[The following was supplied for the record:]



by George Gilder

The Commercial Imagination

During the early 1980s, a huge gulf opened in the perception of the U.S. economy. On one side stood the media, the economics profession, and much of the governmental bureaucracy. Because these forces largely shape the public's image of the world, their vision came to dominate public opinion. It was, in general, a profoundly pessimistic view: a scene of economic stagnation, declining productivity, low employment, scarce resources, soaring deficits, rampant bankruptcies, a diminished America, a cramped and conflicted future, even a new great depression.

On the other side of this gulf was a force that is best summed up as the commercial imagination: the collective view of the particular entrepreneurs—some 16 million strong—who will largely shape the growth and define the future of the U.S. economy.

They continued to create new businesses at a rate of some 600,000 a year: more than six times the average for the stable 1950s, some three times the pace of the flourishing 1960s, and more than twenty times the ballyhooed rate of bankruptcies. Entrepreneurs inspired a venture capital industry that achieved its first billion dollar year in 1981 and continued near that point in 1982. They sustained a rate of employment—nearly 58 percent of the adult population—close to the highest peacetime levels. They continued—entirely beyond the ken of productivity statistics—to foster a technological revolution that is ending the resource and energy crises of the world and increasing the real productivity of the U.S. economy at a pace unprecedented in our history.

There is some truth in the conventional view dominant in the media and the academy. During this period, the U.S. auto, steel, and housing industries—long the foundations of the U.S. economy—did indeed enter a great depression. Nonetheless, an industrial revival was already under way. Rather than a mere upswing of cyclical statistics, it reflected a new leading sector, comparable to automobiles in the twenties, radios in the thirties, and housing and television after World War II.

The new leading industry was computers, in all their applications, and its spearhead of growth—the product which changed the industry from its previous role selling esoteric capital goods into a driving force of growth—was personal computers.

This development was visible on every hand, as billboards proclaiming the Ford Escort a world car gave way to splashy displays for the Apple II, as Tandy alternated with IBM in hailing personal computers in TV coverage of the U.S. Open Tennis Tournament, as Apple polished itself on "Sixty Minutes," and Hewlett-Packard pushed its HP 85 on Monday Night Football, and as hundreds of companies across the country bravely opened offices and assembly lines to compete with the current stars. Steven Jobs of Apple made the cover of *Time*, and Radio Shack, Tandy's sometimes seedy vendor of consumer electronics, began opening more than 500 new stores a year and took the lead among all mass retailers in gross margin on sales (59 percent). Unit purchases of personal computers approached the three million mark in 1982; the number of computer retail outlets rose from several hundred to more than 30,000; and the computer industry had at last found what it had long needed to usher in the computer age: a popular consumer product. Employment patterns shifted dramatically. In the five years between 1977 and 1982 jobs in firms making office equipment and computers rose from one-half the number in motor vehicle manufacturing to 140 percent of that total.

The eruption of new industries is the prime mode of economic revival in all capitalist countries. The cyclical trends which preoccupy economists—the ebbing and flowing of statistical tides which politicians and bureaucrats aspire to rule with fiscal wands from Washington—conceal the essence of economic growth and change: the tempestuous and unpredictable process, often driven by tempestuous and volatile men, that must be at the center of any relevant theory of economic development.

From the midst of such a vortex, a struggling manu-

facturer of personal computers might look at the auto business as remote from his experience and offering few lessons for his pondering. But he would have felt entirely at home among auto men during the period early this century when hundreds of entrepreneurs raced to create and capture a market in automobiles comparable to the new mass market for computers. In 1900, fifty-seven surviving American automobile firms, out of hundreds of contenders, produced some 4,000 cars, three-quarters of which ran on steam or electricity. Companies famous for other products were entering the fray. The makers of the Pope Bicycle, the Pierce Birdcage, the Peerless Wringer, the Buick Bathtub, the White Sewing Machine, and the Briscoe Garbage Can vied for the market with stationary engine makers, machine tool manufacturers, and spinoffs of leading carriage firms, Durant and Studebaker. Coming late in the game was a lanky young engineer from Edison Illuminating Company, named Henry Ford, who had once built a steam tractor.

Americans seemed willing to try anything: by 1900, there were some 200 different types of vehicles using perhaps 100 different modes of propulsion. Many of the early companies even propelled themselves without capital. Like the personal computer buffs to come, these early ventures would get the necessary cash from mail order customers and dealers, and build the product only after the payment arrived.

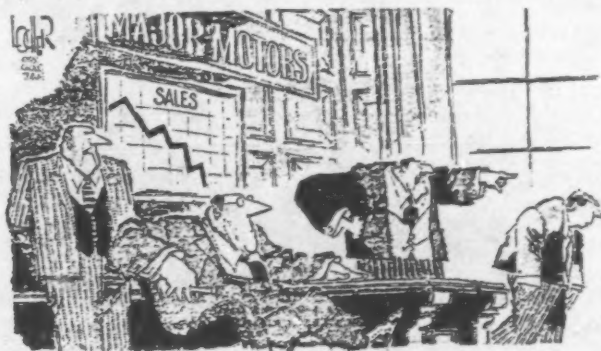
As in virtually every new industry, it was impossible to tell, in the early years, who or what would prevail. Even after the gasoline motor was established, enterprises rose and fell frenetically. The companies which made five of the ten best selling automobiles in 1903—including the leader, Colonel Pope's bicycle firm—went out of the business within the decade. In 1903, Ford sold only 658 cars of a two cylinder design and returned dolorously to the drawing board. Of the ten top producers of 1924, only three had entered the industry by 1908. A survey of the early years in autos should not

be reassuring to Steven Jobs of Apple or John Roach of Tandy, whose companies were tied for leadership in unit sales in 1981.

Prometheus Unchained

In sketching the dynamics of business growth in such an environment, the economics profession offers little guidance or enlightenment. The established theory alternates between a peculiar ideal of perfect competition—with interchangeable goods and no profits, obviously unappetizing to Jobs and Roach—and a fierce critique of the social costs in the monopoly positions which businessmen all tend to seek. A better source of enlightenment for real competitors is the study of industrial history. Providing such an analysis are the strategic consultants led by Bain and Company, who have sprung up and spun off around the Boston Consulting Group. Almost entirely unbeknownst to the economics profession, they have worked out a powerful theory of the forces which shape the rivalries of business and decide the fate of economies. Within their approach, the future arises not from disembodied flows in aggregate markets but from the strategic decisions and productive applications of particular entrepreneurs. In their models, eventual total profits derive from initial profit suppression, from stress on unit costs and share of the market.

Their essential concept is the experience curve. It makes the bold and sweeping claim that in any business, in any era, in any capitalist competition, unit costs tend to decline in predictable proportion to accumulated experience: the number of units sold. The crisply encyclopedic young men who propound the idea will be more specific: whatever the product (pounds of limestone, thousands of transistors, millions of pounds of nylon, or billions of phone calls) and whatever the performance of particular companies jumping on and off the curve, unit costs in the industry as a whole will tend to drop between 20 and 30 percent with every doubling



"Poor Burke! Fired for suggesting lowering the price of cars!"

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of total accumulated units of output. You want passenger cars or polished silicon wafers or consumer power tools or paper bags; the young men will show you the familiar chart, with the inexorable curve. How about farm products? We'll give you chicken broilers. How about service industries? We'll show you kilowatt hours in electrical utilities, or virtual processing units in computer time sharing. Or to meet the strongest challenge, we'll give you dollar value of insurance policies sold. Every product observes, according to the theory, the very same rule of diminishing costs with experience.

Academic researchers saw a challenge and rose to it. In 1980, for example, Michael Porter of the Harvard Business School produced a book which essentially dismissed the whole idea, except in relation to a few commodity type goods. Instead, in his otherwise rich and perceptive volume, he offered an entire new repertoire for the aspiring strategist: U curves, refurbished Kuznets S curves, circle matrices, and even a vaunted Wheel of Competitive Strategy. But Porter's alternative strategies—so called "generic" approaches of differentiation and focus—merely expound the techniques for creating new experience curves. By focusing on a particular geographical market, groups of potential buyers, or part of a larger product line—or in differentiating a product by service, image, or special features—a company will create or discover a new experience curve applicable to the new market chosen. By a strategy of "focus" on wealthy customers and "differentiation" by quality, Mercedes competes in the luxury market. But it still faces an experience curve. As its features are continuously adopted by cheaper vehicles, it must continuously create new challenges of quality for rivals. And it must continuously improve its own efficiency and value in competition with other luxury cars.

The experience curve is no alternative to careful analysis, but an extraordinarily useful instrument of it. It is not an automatic result; companies, industries, and even nations can drift off the curve; it merely defines their opportunity and their peril, for others surely are conspiring to get on it. The experience curve tells you that Satchel Paige was right about the reasons not to look back: someone is gaining on you. (Perhaps he's Japanese.)

To chart the curve is hard work, as the consulting firms discovered. It depends on a series of difficult and sometimes elusive definitions which parallel the strategic thinking processes of focus and differentiation. The product, the unit of measurement, the relevant market all have to be identified, economic value to the customer must be distilled in integrated units of quantity and quality. Such definitions are always the crux of the analytic problem in business strategy. What is the firm actually selling? And to whom? And by what measure of utility is it valued? This is the problem which confronted the automakers early in this century, and it is the question now facing the makers of computers.

Was the relevant business recreational driving,

status display, or mass transportation? The answer to that question separated the manufacturers of Packards, Pierce Arrows, and Mercedes from the makers of Fords, Chevrolets, and Pope quadricycles. Is the personal computer an appliance for complex scientific computing, small business data processing, video games, remote information services, financial data bases, computer education, portable office applications, or is it the instrument of some new mass rite of passage as indispensable in this era as McGuffey's reader, the TV, the Model T, the Springfield rifle of other epochs?

What the experience curve shows is that whatever market or product a particular business defines for itself, it will usually have to sell more than its competitors over the long run in order to have lower costs and thus potentially higher profits. Moreover, it will have to grow to survive. *Market share* becomes a manifestation of a company's experience. As the competition proceeds, the lowest cost producers reduce their prices and expand their share of the market. Then these market leaders will be able to expand their output and their experience at a still faster pace, moving down the curve to positions of yet lower cost, at the familiar rate of about 25 percent for every doubling of output. Finally, with the market fully exploited, the shares of it stabilize, a perfectly healthy oligopoly tends to emerge, experience grows more slowly, and prices move down a milder gradient in a "mature" and relatively declining industry, like U.S. autos in the eighties. That is the end game, which may signal a new global beginning in products and markets.

The Great Auto Race

As the twentieth century proceeded through its first decade, there were some fifty auto companies in the marketplace. The manufacturers of electric cars struggled for a breakthrough in the problem of power storage, but unexpectedly it did not come. Pope's effort to launch a fleet of two-and-one-half ton electric taxis in New York City lent new meaning to the standing joke of lead balloons. Along with the collapse of the electric car came the end of the one hundred-year dream of an automobile powered by steam. One ride in a steam-powered Mobile in 1902, lurching, belching, and hissing below him, had nearly given Billy Durant a sense of security in the carriage trade. The experience of building a steam tractor had pushed Henry Ford into internal combustion.

The technological turning point, perhaps, was a fire in 1901 in the plant of Ransom Olds which destroyed all his elaborate equipment for producing electric Oldsmobiles. One rejected gasoline prototype was recovered. It became the first mass-produced car, selling 7,000 during the next three years and introducing a series of impressive mechanical innovations and a body designed by Fred Fisher.

What made this progress possible was the rapid improvement and reliable mass production of the internal combustion motor. This played a role in the early auto

business comparable to the role of the microprocessor central processing unit—the computer on a silicon chip—in the personal computer trade. Like the creation of reliable mass-produced microprocessors, the gasoline engine emerged from a steadily intensifying twenty-five year rivalry. It embraced hundreds of machine shops in Europe and the United States. Finally, in the first years of the twentieth century, the long effort jelled, allowing the automobile industry to focus on designs for mass production and marketing. It then could lure the talent to move automobiles from machine shops into mass consciousness.

Billy Durant, who knew all about production and selling from his carriage business, decided it was time to move into cars after several months of driving a prototype containing David Buick's valve-in-head engine—the most powerful in the world for its size—through rural Michigan in 1904. Within four years, Durant was to parlay his sturdy Buick vehicle into domination of the automobile industry, with a 25 percent share of the market in 1908, the year he founded General Motors.

His key move—paralleling the recession breakthroughs throughout business history, including the Japanese auto and semiconductor surges in 1975 and 1976—was to expand his productive capacity all the way through the panic and depression of 1907-1908, which drove many producers out of the market. The 1908 selling season found Buick the only company with a full line of cars, from a \$2,500 Model S touring car to a \$900

White Streak. The Streak doubled its sales to 8,485, moved Buick rapidly down the experience curve, and set the stage for one of the decisive confrontations in the history of capitalism.

Henry Ford made a portentous announcement: "I will build a motor car for the great multitude. It will be large enough for the family but small enough for the individual to run and care for. It will be constructed of the best materials, by the best men to be hired, after the simplest designs that modern engineering can devise. But it will be so low in price that no man making a good salary will be unable to own one—and enjoy with his family the blessing of hours of pleasure in God's great open spaces."

Ford fulfilled his boast with the Model T. Its ruggedness and clearance was such that, as Jonathan Hughes has written, "Boys in the West could drive out over the sagebrush and rocks chasing jackrabbits." One man drove one to the bottom of the Grand Canyon and out. Thus Ford had circumvented what seemed an insuperable short-term obstacle to the democratization of the car: namely, the absence of roads.

Nonetheless, during the first year, at a selling price of \$850, the Model T lost money and market share to the dashing \$900 Buick. To increase his profits the next year, Ford raised his price a full \$100 to \$950 and saw his sales more than double to 12,292. But his share of the market declined again as Buick, Oldsmobile, and other companies proceeded to underprice him.

MINNEAPOLIS STAR AND TRIBUNE



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Senator CHAFEE. We'll get back with questions to both you and Mr. Janeway, but first let's hear from Mr. Janeway.
I appreciate your coming, sir.

**STATEMENT OF ELIOT JANEWAY, ECONOMIST AND PUBLISHER,
THE JANEWAY LETTER, NEW YORK, N.Y.**

Mr. JANEWAY. Mr. Chairman, it is a privilege to be here. I have a statement relating to American foreign trade policy. I would like to preface it, however, by addressing myself to what I gather is the emphasis in the hearings' focus on high tech.

Senator CHAFEE. Yes. If you have a better word I'd be glad to hear it—"technical industries" or the "growth industries of the future."

Mr. JANEWAY. Well, let me be the devil's advocate and speak for low tech.

The workshop industries. Because my observation of Japanese strategy is that the first, favored, top-priority customers of their own high-tech industries are their smokestack industries. That is one reason why they've done so well, particularly at steel, aluminum, automotive, and appliance production.

My statement relating to our foreign trade policy is that this is America's last chance, in the mid-1980's, to rebuild her rundown workshop industries, and the way to do it is to require investment in them—steel, automotive, and the rest—by her foreign industrial competitors who are outselling her in her domestic market.

Why not sell our markets, our import markets, to Japan and other competitors, the reciprocal consideration being their obligation to rebuild our dilapidated industries for us? Our demoralized workshop industries can no longer manage with the present level of import competition, but these competitors of ours cannot live without their present level of dollar sales volume. It's the only major market—I emphasize the "only major" nonbarter, nonsubsidized market open to the Japanese, the Germans, and the others.

A simple device will do the trick: Require successful importers to file plans of investment in the securities and/or assets of the industries they are beating in the market.

The "Style Section" of the Sunday Washington Post is not normally an oracle to consult for guidance on the role of the American economy in the world. This past Sunday, however, it published a feature article putting us on notice how far we have already traveled down the British road to liquidation of our industrial and financial leadership.

The article sets forth in glamorous detail the brisk competition among four Washington luxury hotels in catering to the sky's-the-limit whims of sheiklings at \$7,500 a night. The proprietors of London's chic West End hotels could teach us how to stop undercharging and to start recouping our losses as an industrial power by converting what's left of our economy into a high-class playground at the disposal of our foreign lords and master who hold our economy in pawn.

Of course, our economic mentors of the monetarist persuasion in London are reassuring us that every time we shut down a steel mill but then rent out a floor in a luxury hotel to a sheik, we can

relax and anticipate further gains in international competitiveness and domestic productivity. I regard this as a counsel of despair. Countries relying on monetarist economics for guidance relieve Russia of any pressure to waste the valuable time of the KGB to do them in.

President Reagan, I regret to note, has followed his monetarist sympathies into the adoption of the view that the splintering of our industrial base is a sign of progress. He told his televised news conference just a few weeks ago that much of the work force now disemployed from plants in liquidation will have no chance of reemployment at their old occupations as we evolve, he said, "from an economy primarily producing goods into an economy primarily producing services." The idea, I suppose, is that we can look forward to America's evolution into a nation of computer programmers and tennis coaches. In that case, no doubt, we will keep ourselves busy and reinject growth into our economy's shrunken power load, flashing messages back and forth to one another, tabulating the debts we run up taking out fourth mortgages to build tennis courts.

Fortunately for President Reagan and for all of us, he has a fallback position, which he may have forgotten, but which is equally well known, and for which he has stood with characteristically stubborn steadfastness—namely, his commitment to the discipline indicated by the actual direction of the marketplace rather than by any faddish theory about the direction the market should take.

Japan, of course, provides the litmus paper test. Within recent memory her industrial executives and the presiding bureaucrats to whom they report were gun shy of assuming any entrepreneurial responsibility for industrial plants in this country.

This was the explicit excuse the securities arm of Mitsubishi gave me in 1979, when I responded to its invitation for guidance in the Chrysler crisis by recommending that it relieve the U.S. Treasury of any need for loan guarantees by making a market bid to take over control of the company and meet its needs for modernization money.

I was given two answers: The first, that the Chrysler tank arsenal involved national security sensitivities to which Japanese management would not want to be privy.

Mr. Chairman, I interrupt my statement to point out that the Japanese Prime Minister here today is directly contradicting that position dictated by Miti in Tokyo, because now Japan wants to become a prime defense contractor to us.

Second, Japanese and American labor and community relations were too different to invite Japanese participation in the control of American industrial operations. My suggestion that Chrysler would be forced to sell its tank arsenal, as it has, and that Washington would pressure Japan to participate in American defense arrangements, as it has, fell on deaf ears.

As it turned out, however, Chrysler was the only "name" stock during the 1982 stock market recovery to act as sensationally as a gold stock, rising from \$3 to \$18, a 600-percent gain in 6 months, with a powerful assist from Japan's hard-cash, hard-goods manufacturing contribution to its sales success.

I should note that any bull market for gold stocks is a bear market for America.

The contrast between Japan's noninvolvement in 1979 and her involvement in 1983 not only measures her striking market breakthroughs but also reveals a basic requirement of mass marketing: The inescapable need to support the first wave of imports into targeted markets with follow-up investment in facilities there.

By the end of 1982 Japanese industrial investment in America had become standard operating practice, like American industrial plant liquidation. Moreover, while Japan is thoroughly committed to capitalism, her brand of it commit her industrial managements to clear their investments with the planning high command in Tokyo. Clearly, therefore, the broad front on which our victorious Japanese competitors are staging their high-powered new industrial investment invasion of America points out a moral for us. The architects of the Japanese miracle are proceeding on the premise that industrial investment in America's discredited and demoralized workshop industries has a future. So does the employment of industrial labor in America, contrary to the misimpression that President Reagan has effectively gathered from his monetarist advisers.

But one Japanese commitment in particular stands out as more meaningful than any of the disturbing events of 1982 in making the case for an all-out American effort at industrial renewal. I refer to a decision that was symbolic, yet more than a mere token: Another large-scale decision by Mitsubishi. It put up \$100 million for the privilege of taking over Ford's run-down antique of a steel mill in the heart of Detroit's industrial ghetto, which we have given up for lost. We have even liquidated into bankruptcy the luxury hotel complex financed by Ford.

On top of that, it is putting \$250 million into the mill's modernization, this just when Bethlehem is scrapping its Buffalo, Johnstown, and San Francisco mills and presumably opening new careers for its pink-slipped steel puddlers on ski slopes and marinas.

Lest we forget, the River Rouge steel mill was not just another relic of a more hopeful and dynamic day in America; it was the pet project of Horatio Alger's embodiment in real life, Henry Ford himself. He did not trust bankers, and he did not trust academic thinking, with good reason. He was his own kind of home-grown nut with a monkey wrench, which was his own—Mr. Gilder, he did not operate on his own savings: he borrowed others: He was determined to put his own steel mill behind his own auto plant and to put his own bank behind both.

A generation later, the summit in Tokyo in its collective wisdom is putting its money and its plan where the most colorful, controversial individualist in our industrial history put his, not where the brain trusters of our disaster are recommending that we put ours.

The River Rouge steel mill is not diversified to benefit from any broad market improvement in demand outside the auto industry; all its eggs are in the Detroit basket. The authorities in Tokyo have given Mitsubishi the go-ahead to bet that Detroit's Big Three will be able and anxious to buy and pay for more Detroit steel. Clearly, they have the sense to regard hard investment in industrial modernization—with American labor—at the hard core of our steel and auto complex as good business, even if we ourselves don't.

I just wanted to say that as America's beloved sage, Damon Runyon, used to say, "The race may not always go to the swiftest nor the battle to the strongest, but that's sure the way you got to bet."

What are we to do? Take the protectionist bait, and fling the world back into 1931, with America following, while there is still time to head off another 1929? Or pay lip service to free trade and free markets as if time were still on the side of business-as-usual?

Barring imports would be tantamount to cutting off our noses to spite our faces, and inviting them in for no consideration would put us in the position of giving away what was meant to be sold, causing another of our ancestors, the old-fashioned Yankee trader, who may have roamed out of Providence, to roll over in his grave.

All dilemmas, once faced, are challenges to avoid the worst of both worlds and to grasp the best of both worlds.

Here is a simple suggestion, stimulated by the spectacle of Japan's recognition that its American market is too large just to sell into and too vital not to invest in: Why not sell our markets to Japanese and other competitors, the reciprocal consideration being their obligation to go the Mitsubishi way and rebuild our dilapidated industries for us, and, yes, invest with us in our high-tech industries?

Our Government can't, for reasons all too familiar, and our managers wouldn't if they could. A simple device will do the trick: Require successful importers to file plans of investment in the securities and/or assets of the industries they are beating in the markets. This would break the vicious cycle of falling investments and rising imports. We're paying for the imports anyway. My approach would invite the importers to pay for our investments.

And, in conclusion, our banks, in 1981, made take-over loans of a nonproductive nature of \$40 billion. In the first half of 1982 they made take-over loans of another \$55 billion—nearly 100 in all. Two of the companies, who were prime borrowers, have had their credit ratings downgraded. Another, DuPont, has been selling off the properties involved at a discount.

Why not have the Federal Reserve Board—and I criticize it more for this than for anything else, for its winking at the margin requirements that you and I are subject to, and permitting a double standard—why not have the Federal Reserve Board instruct the banks that take-over loans violate the margin requirements, but that productive loans by the banks for capital investment purposes are to be deemed favorable, and offer Japanese and other foreign investors equal access to the banks for the purpose of making productive loans, provided they are productive loans supported by plans of investment filed?

Senator CHAFEE. It seems to me that one of your principal points is not to take the protectionist bait.

Mr. JANEWAY. Right.

Senator CHAFEE. Are you not, in effect, seizing that bait by requiring successful importers to invest in our industries? It seems to me this is a violation of the spirit of free trade.

Mr. JANEWAY. I'm ready. I'm on Mr. Price's side of that argument. I want fair trade.

Senator CHAFEE. But the fair trade, as Mr. Price interpreted it, was fair access to markets. It wasn't a requirement that if you sell here you must do so and so, as in your case you must invest in the productive facilities of that nation.

Mr. JANEWAY. I think Mr. Price is pursuing—with all due respect—pie in the sky. We are not going to get free access to Japanese markets.

And also dealings, he is quite right in saying, in the world today, except in respect to the United States, are government subsidized and government to government. Corporations are just pawns on the chessboard.

Senator CHAFEE. Mr. Gilder, your principal thrust was lowering taxes, and that would help these emerging technical industries provide the capital, as in your Idaho situation.

Do you have any other suggestions? Have you given any thought to the point Mr. Price was making about the combinations being exempt from the antitrust laws?

Mr. GILDER. Now, I think that's probably a good idea. I am not so sanguine about the effects of these combinations. I noticed that the major government combination, VHSIC, was rejected by several of the most important semiconductor companies on the grounds that it would merely divert attention from the same kind of researches proceeding more efficiently without the reports and red tape within companies themselves.

The point about savings, however, is not altogether focused on high-tech industries. As a matter of fact, the reason why Mitsubishi and these other companies and countries have been able to invest so heavily in these old-tech industries is because their savings rates are far higher. Japan's rate, for example, is three times as high. They did have a rate about five times as high, but have let tax rates draft upward in recent years.

The availability of capital in Japan has been so much greater than in the United States that they have been capable of financing these very capital-intensive industries. This is why the Japanese have been able to succeed both in high tech and low tech, while we have only succeeded in high tech, because low-tech firms tend to be so capital intensive that they are most heavily punished by the tax laws and the extreme dearth of savings in the United States.

Senator CHAFEE. How do you explain that United States Steel can't find any money to modernize their plant, but they can scrape up \$5 billion to buy Marathon?

Mr. GILDER. Yes. You know the Japanese have made too much investment in steel, also. It's a real burden for the Japanese economy now, and it's going to become an increasing burden in future years.

Steel is declining in uses. It is being replaced increasingly by ceramics, amorphous metals, aluminum, a whole array of new plastics, and other kinds of materials that are increasingly encroaching on ferrous metals. To make heavy new investments in steel at this juncture, when the world steel industry is hugely overbuilt and the Japanese steel industry, in particular, has been too heavily lavished with capital, is just silly. That's why it was better to buy an oil company than throw good money after bad in American steel companies, which are already far behind.

I doubt very much that except in specialty steels and new steel applications the United States is ever going to retrieve its position in steel and that's just as well.

The surest sign that the British were going downhill came when the chief adviser to Mrs. Thatcher announced that no modern country could exist without a thriving steel industry. That was a real signal that the British didn't have a clue of what was going on in the world.

Senator CHAFEE. Your IRA point is an interesting one. Can IRA's only be invested in listed companies?

Mr. GILDER. Yes, listed companies, and there are a number of restrictions which sum up as rendering the IRA funds not disposable savings. They have to be institutionalized. If you institutionalize the savings, then it's acceptable; but if you invest it in small businesses you lose all benefits of IRA.

Senator CHAFEE. How about pension plans?

Mr. GILDER. Well, pension plans are burdened with ERISA, and I gather that some changes in those rules are being contemplated. I fervently support those reforms, because essentially 0.06 percent of all pension moneys goes into venture-capital projects, and that's ridiculous. The reason for it is the "prudent man" rule which is enforced on these pension funds, and I think it is very destructive. It means that pension funds grow much more slowly than they would if they were allowed to make more risky investments.

Senator CHAFEE. What do you think of Mr. Janeway's proposal?

Mr. GILDER. I think it really is a major protectionist device. I think, however, that the same kind of process is underway, anyway, with Honda and Mitsubishi and other companies investing in American plants increasingly. And I think that process is good, because I agree with Mr. Janeway that full access to the Japanese economy is not going to be granted; so what we want is access to Japanese capital. That's an important point he's making. And it does focus on the real problem, because the Japanese, by sealing off their capital markets, have managed to maintain interest rates much lower than they would be, and a yen value much lower than it would be, if those capital markets were open to the world financial markets.

So there is no question that he has put his finger on a crucial point.

Mr. JANEWAY. I thank you for your endorsement. [Laughter.]

Mr. GILDER. I don't endorse some law that requires that particular kind of mechanistic response. It really would hobble international trade.

Senator CHAFEE. No technological employment for Congress, now.

Mr. ZSCHAU. Mr. Gilder, it is for me to have a chance to talk to you. I read your book "Wealth and Poverty," and I think it's outstanding. I appreciate your remarks.

I was a little surprised when you talked about the impact of the tax reduction on revenues that the press didn't all get up and run to call their newspapers.

Mr. GILDER. They won't.

Mr. ZSCHAU. This is a fact which, if true, is little known; that the tax cut in the higher income brackets increased taxes paid by the wealthy.

I was wondering if you could explain the mechanism by which you think this occurred; that is, why were there more taxes paid by those in the higher brackets with the lower rates?

Mr. GILDER. People moved out of tax shelters into taxable investments.

Senator CHAFEE. When they came down from 70 to 50?

Mr. GILDER. Right. And the capital gains tax dropped. People invested more in the sort of companies and investments that generate capital gains, interest, and other capital income.

Mr. JANEWAY. Mr. Chairman?

Senator CHAFEE. Mr. Janeway.

Mr. JANEWAY. May I respond to Mr. Gilder's endorsement to my approach by supplementing it? The classic argument, or the basic argument, against protectionism, the reason it has a bad name, is that it hurts the consumer. My approach would in no way penalize the consumer. It would give the consumer every benefit the consumer now enjoys, from subsidized pricing by the Government, the central banks, and the Government-owned and controlled banks, behind the competing industries.

So there is no protectionist thrust that would get Grover Cleveland's ghost chasing me in my proposal. [Laughter.]

Senator CHAFEE. Except one thing leads to another, and there is retaliation. It seems to me you get into an escalating war—

Mr. JANEWAY. But we are overdue to retaliate. We have the market. We have what they need. And I'm afraid I need to be ungracious to Mr. Gilder and argue with him a little bit.

I don't go with his direct correlation between savings and investments. Yes; the rate of retail savings in Japan is very high, over 20 percent, but that's a rationing device.

Japanese industry is enormously leveraged, and on a long-term basis all Japanese industrial investment is borrowed at the banks and not in their capital markets.

Here in this country we suffer from no lack of capital or of savings. In fact, unfortunately, most of our savings are frozen in these money market funds, doing the economy very little good if any. Moreover, most of your entrepreneurial investment in this country comes from people who don't like working for large corporations—a dissent from Mr. Price's view—and most of it is done by shoe-string borrowing.

Mr. GILDER. I agree.

Senator CHAFEE. Thank you gentlemen for coming, you have certainly contributed to this discussion and effort.

Mr. GILDER. Thank you.

Mr. JANEWAY. I'm afraid that I have a book coming, too, and that its title will be timely: "Prescriptions for Prosperity."

Senator CHAFEE. We will look forward to that.

The next panel consists of Mr. Pratt, president of Venture Economics; Mr. Doan, chairman, Doan Resources Corp.; Mr. Morgenthau, president of Morgenthau Management; Michael Bell, of Hixon Venture; and Morton Collins.

Gentlemen, we appreciate all of you coming.

TESTIMONY
OF
JANEWAY
ELIOT JANEWAY

Mr. Chairman, members of this distinguished panel, I deem it a high honor and a professional privilege to appear before you to testify on the burning issues identified in your call to these hearings.

The "Style" section of the Sunday Washington Post is not normally an oracle to consult for guidance on the role of the American economy in the world. This past Sunday, however, it published a feature article putting us on notice of how far we have already traveled down the British road to liquidation of our industrial financial leadership. The article sets forth in glamorous detail the brisk competition among four Washington luxury hotels in catering to "sky's-the-limit" whims of sheiklings at \$7500 a night. The proprietors of London's chic West End hotels could teach us how to stop undercharging and to start recouping our losses as an industrial power by converting what's left of our economy into a high-class playground at the disposal of our foreign lords and masters who hold our economy in pawn. Of course, our economic mentors of the monetarist persuasion in London are reassuring us that every time we shut down a steel mill, but then rent out a floor in a luxury hotel to a sheik, we can relax and anticipate further gains in international competitiveness and domestic productivity. I regard this as a counsel of despair. Countries relying on monetarist economics for guidance relieve Russia of any pressure to waste the valuable time of the KGB to do them in.

President Reagan, I regret to note, has followed his monetarist sympathies into the adoption of the view that the splintering of our industrial base is a

sign of progress. He told his televised news conference just a few weeks ago that much of the work force now disemployed from plants in liquidation will have no chance of reemployment at their old occupations as we evolve-- and I quote his use of the cliché, which I myself reject--from an economy primarily producing goods into an economy primarily producing services. The idea, I suppose, is that we can look forward to America's evolution into a nation of computer programmers and tennis coaches. In that case, no doubt, we will keep ourselves busy and reinject growth into our economy's shrunken power load flashing messages back and forth to one another tabulating the debts we run up taking out fourth mortgages to build tennis courts.

Fortunately for President Reagan and all of us, he has a fallback position, which is equally well-known and for which he has stood with characteristically stubborn steadfastness, namely, his commitment to the discipline indicated by the actual direction of the marketplace rather than by any faddish theory about the direction the market should take. On this point--of what the market place should do--Mr. Chairman, I feel obliged to confess that I share the view of the forgotten member of the Kennedy clan, who was by no means the least practical member of the illustrious family. Joe Kennedy used to warn budding economists that they should never say that a market should do anything. Turning to the actual trend of events in the real world, as we survey the dimensions of our ongoing defeat on our own native heath at the hands of our client governments around the world, whom

we continue to protect and finance at our cost, I note that they are entering a powerful dissent from the British formula for growth by liquidation of the national structure of industrial power.

Japan, of course, provides the litmus paper test. Within recent memory her industrial executives and the presiding bureaucrats to whom they report were gun-shy of assuming any entrepreneurial responsibility for industrial plants in this country. This was the explicit excuse the securities arm of Mitsubishi gave me in 1979, when I responded to its invitation for guidance in the Chrysler crisis by recommending that it relieve the U.S. Treasury of any need for loan guarantees by making a market bid to take over control of the company and meet its needs for modernization money. I was given two answers: the first, that the Chrysler tank arsenal involved national security sensitivities to which Japanese management would not want to be privy; the second, that Japanese and American labor and community relations were too different to invite Japanese participation in the control of American industrial operations. My suggestion that Chrysler would be forced to sell its tank arsenal, as it has, and that Washington would pressure Japan to participate in American defense arrangements, as it has, too, fell on deaf ears. As it turned out, however, Chrysler was the only "name" stock during the 1982 stock market recovery to act as sensationally as a gold stock, rising from \$3 to \$18, a 600 percent gain in six months, with a powerful assist from Japan's hard-cash, hard-goods manufacturing contribution to its sales success.

The contrast between Japan's non-involvement in 1979 and her involvement in 1983 not only measures her striking market breakthroughs, but also reveals a basic requirement of mass marketing: the inescapable need to support the first wave of imports into targeted markets with follow-up investment in facilities there.

By the end of 1982, Japanese industrial investment in America had become standard operating practice, like American industrial plant liquidation. Moreover, while Japan is thoroughly committed to capitalism, her brand of it commits her industrial managements to clear their investments with the planning high command in Tokyo. Clearly, therefore, the broad front on which our victorious Japanese competitors are staging their high-powered new industrial investment invasion of America points out a moral for us. The architects of the Japanese miracle are proceeding on the premise that industrial investment in America's discredited and demoralized workshop industries has a future. So does the employment of industrial labor in America, contrary to the mis-impression that President Reagan has effectively gathered from his monetarist advisers.

But one Japanese commitment in particular stands out as more meaningful than any of the disturbing events of 1982 in making the case for an all-out American effort at industrial renewal. I refer to a decision that was symbolic, yet more than a mere token: another large-scale decision by Mitsubishi. It put up \$100 million for the privilege of taking over Ford's run-down antique of a steel mill in the heart of Detroit's industrial ghetto, which we have given up for lost. On top of that, it is putting \$250 million into the mills' modernization, this just when Bethlehem is scrapping its Buffalo, Johnstown, and San Francisco mills and presumably opening new careers for its pink-slipped work force on ski slopes and marinas. Lest we forget, the River Rouge steel mill was not just another relic of a more hopeful and dynamic day in America. It was the pet project of Horatio Alger's embodiment in real life, Henry Ford himself. He did not trust bankers, and he did not trust academic thinking. He was his own kind of home-grown nut with a moneky wrench, which was his own. He was determined to put his own steel mill behind his own auto plant and to put his own bank behind both.

A generation later, the summit in Tokyo, in its collective wisdom, is putting its money where the most colorful, controversial individualist in our industrial history put his, not where the brain trusters of our disaster are recommending that we put ours. The River Rouge steel mill is not diversified to benefit from any broad market improvement in demand outside the auto industry. All its eggs are in the Detroit basket. The authorities in Tokyo have given Mitsubishi the go-ahead to bet that Detroit's Big Three will be able and anxious to buy and pay for more Detroit steel. Clearly, they have the sense to regard hard investment in industrial modernization--with American labor--at the hard core of our steel-auto complex as good business, even if we ourselves don't. Japan, more than ever, is making the trend and is making it in Detroit. She is putting her mouth behind her imports into America, but her money into her investments inside America. As America's beloved sage, Damon Runyon, used to say, "The race may not always go to the swiftest, nor the battle to the strongest, but that's sure the way you got to bet." Yes, Mr. Chairman, Detroit does have a future, and so do our run-down industrial centers. Surely, we will benefit from making Japan and the others an offer they cannot refuse.

What are we to do? Take the protectionist bait, and fling the world back into 1931, with America following, while there is still time to head off another 1929? Or pay lip service to free trade and free markets as if time were still on the side of business-as-usual? Barring imports would be tantamount to cutting off our noses to spite our faces and inviting them in for no consideration would put us in the position of giving away what was meant to be sold, causing another of our ancestors, the old-fashioned Yankee trader, to roll over in his grave.

All dilemmas, once faced, are challenges to avoid the worst of both worlds and to grasp the best of both worlds. Here's a simple suggestion, stimulated by the spectacle of Japan's recognition that its American market is too large just to sell into and too vital not to invest in. Why not sell our markets to Japanese and other competitors, the reciprocal consideration being their obligation to go the Mitsubishi way and rebuild our delapidated industries for us? Our government can't, for reasons all too familiar, and our managements wouldn't if they could. A simple device will do the trick; require successful importers to file plans of investment in the securities and/or assets of the industries they are beating in the markets. This would break the vicious circle of falling investments and rising imports. We're paying for the imports anyway. My approach would invite the importers to pay for our investments.

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FOR IMMEDIATE RELEASE

REQUIRE INVESTMENT BY FOREIGN MANUFACTURERS IN U.S. INDUSTRIAL RENEWAL,
JANEWAY TELLS SENATE

WASHINGTON, January 19--America's last chance in the mid-1980's to rebuild her rundown workshop industries is to require investment in them by her foreign industrial competitors who are taking over her markets, Eliot Janeway, president of the Janeway Research Corp., told the Subcommittee on Savings, Pensions, and Investment Policy of the Senate Finance Committee today.

"Why not sell our markets to Japanese and other competitors, the reciprocal consideration being their obligation to rebuild our dilapidated industries for us?" Janeway asked. America's demoralized workshop industries can no longer manage with the present level of import competition, he said, but these competitors cannot live without their present level of dollar sales volume. "It's the only major market left open to them," he said.

Janeway said that "a simple device will do the trick: require successful importers to file plans of investment in the securities and/or assets of the industries they are beating in the markets."

The well-known political economist cited the example of the \$100 million purchase of Ford's River Rouge steel complex in Detroit by Mitsubishi, the Japanese conglomerate, in 1982. "On top of that," Janeway said, "Mitsubishi is putting \$250 million into the mill's modernization, this just when Bethlehem is scrapping its Buffalo, Johnstown, and San Francisco mills."

"The fact that the authorities in Tokyo have given Mitsubishi the go-ahead to finance its modernization at the same time that it has the go-ahead to

manufacture Chrysler's bestseller (the subcompact Colt) is irrefutable evidence that they have the sense to regard hard investment in industrial modernization--with American labor--at the hard core of our steel-auto complex as good business, even if we ourselves don't," he said.

Janeway also told the subcommittee, chaired by John Chafee (R-RI), that taking "protectionist bait", as advocated by members of both parties as at least a partial solution to the economic crisis, "would be tantamount to cutting off our noses to spite our faces." Barring imports would "fling the world back into 1931, with America following, while there is still time to head off another 1929," he said. "Standing pat with business-as-usual in the name of free trade would fling the U.S. back into 1931, with the rest of the world following."

* * *

January 19, 1983

STATEMENT OF STANLEY E. PRATT, PRESIDENT, CAPITAL PUBLISHING CORP., WELLESLEY HILLS, MASS.

Mr. PRATT. I have given you a prepared statement which I am not going to read here today, but I am going to summarize from it and try to highlight some of the overview and set the stage for some of the other speakers here.

Since I am not quite as well known as these leading economists who were just here, I'll give you a little bit of background about who I am.

Basically, I am president of Capital Publishing Corp. We, through a data base of some 3,700 companies backed by venture capital companies, follow the trends in what goes on in the venture capital community.

I am really here today to talk about and encourage the development of more independent growth businesses. We feel that it is extremely important to build a diverse and viable economic base that will take advantage of our Nation's quite unique resources and exploit our strengths in the shift from an industrial-based society to one based upon knowledge and information.

This shift is on today; it is not something that is coming tomorrow. And I think people have to recognize this immediately. For us to compete in international markets today, we have to build upon our own base of knowledge and information.

As I say, I'm not going to be relating directly to that, although you might be interested in looking at some of the charts as we are looking at some of the data.

I think it is important to recognize that this Nation—we now do a great deal of work overseas—has a very unique resource. We have the entrepreneurs and the opportunity, more so than anywhere else in the world.

And remember one thing. When I represent and am looking at the venture capital community, they don't drive the process of building business; the process is driven by entrepreneurs. As one leading venture capitalist says, "We can't push a string."

Senator CHAFEE. What is your definition of an "entrepreneur"?

Mr. PRATT. An entrepreneur is basically that person who is willing to take the risk and build a business. There is a popular misconception that entrepreneurs are basically inventors who tinker around in their basements. Most entrepreneurs that are successful are second or third level managements. They are the people who are going to create businesses and provide the bulk of the employment that these types of businesses do employ, as you will see as I discuss through my statement.

Senator CHAFEE. An entrepreneur takes an idea to the venture capitalists who put it together, and make it fly?

Mr. PRATT. Generally, in most cases, the entrepreneur recognizes a market niche. He recognizes a market niche that is too small for a major corporation.

He will then look at it and devise a product that will meet today's needs, not tomorrow's needs, in that marketplace, hopeful that it will be expanding as it goes along. The venture capitalist then looks to support it with him and provides a great deal of value added.

The difference between venture capital investment and any other kind of investment is a couple of factors: One is the long-term nature. The venture capitalist does not know whether he has a good investment for 3 to 5 years. That differs from the instant gratification expected in most of our market investments today.

He also must work for an extended period of time with that entrepreneur in a supportive partnership. He is not the boss. The entrepreneur is the boss. He may have to fire the entrepreneur at some point; but the fact is, the venture capitalist may be in a bad position if he has to. So venture capitalists tend not to like to do that.

So the long-term, value-added process is extremely important both with the entrepreneur and with the venture capitalist.

Let's look at a few numbers, looking at the growth of the industry.

The venture capital industry, from the time of the capital gains tax reduction in 1978, has just about tripled. We have gone from \$2½ billion under management to about, at the end of 1982, \$7.5 billion.

Now, while this is a quite significant growth; if you think about it for one moment, it is less than, just about 1 percent of the total assets under management in the pension plans.

Money market funds are the least productive use of capital, in my opinion, versus venture capital as the most productive use of capital. We have \$7.5 billion versus \$200 billion in money market funds. So the growth has been phenomenal in the last few years but is still a small factor in our capital markets.

The numbers that I've just released today for the very first time show that once again in 1982 we had record amounts of new capital into the industry and a record amount of disbursements by the industry to small and rapidly growing businesses. We estimate that \$1.7 billion came into the industry in 1982, and \$1.75 or \$1.8 billion was disbursed. That chart is on page 4. You will note on that chart rather dramatically what happened with the reduction in the capital gains tax rates.

In the 8 years from the time that Congress raised capital gains tax rates in 1969 to the time that they were lowered in 1978, the total amount of new capital in the industry was \$466 million. In 1978 it was \$570 million. In 1979 through a glitch with ERISA and the Department of Labor, only \$319 million came in, then \$900 million, to \$1.3 billion, to \$1.7 billion. So we have had \$4.8 billion into the process since the reduction in capital gains tax.

I think the point I want to stress fairly heavily is what is it that drives venture capitalists?

They may not know it, but the principal thing that we find that drives them is investing in companies that bring about productivity increases.

We hear a great deal about high technology—and I'm going to try to give you a new word for that, by the way, because I think we have to get off of that kick. People are scared of "high technology," and I will deal with that in a little bit.

But the major thing seems to be productivity increase. We did a study 2 years ago for the GAO, which finally made it through the bureaucracy last August and was published as a GAO report,

where we showed that 54 percent by number and 61 percent of the dollar amount of all venture capital investments in the decade of the seventies was related to productivity increase.

Since we were the contractor who provided that data for the GAO, I ran the numbers in the computer this weekend for the fun of it, and found that in 1980 the jump was to about two-thirds of all investments, and in 1981 to about three-quarters of all investments; whereas technology-related investments are running still about two-thirds of all the investments. So it's now moved ahead, basically, in productivity-related investments, according to the GAO guidelines, which is not noted for soft definitions.

In that particular report, some other quite startling data that came out of it was the other economic benefits outside of productivity increase.

We were able to review 72 companies that had gone public that were related to productivity increase. What we found in those 72 companies was that venture capitalists had invested \$209 million during the seventies. In 1979 alone, those companies had aggregate sales of \$6 billion that were created by venture capital investment. During the past 5 years of that decade, the last 5 years, sales were growing at the rate of 33 percent per annum.

What is interesting is that those companies created 130,000 jobs, and over \$450 million in Federal tax revenues, and \$900 million in export sales. This means the jobs were costing them about \$1,600 apiece. I defy anybody to show me better numbers than that.

Senator CHAFEE. I am looking at your chart on page 4 where you cite the capital gains increase of 1969 or 1970, and the deleterious effects of that. Wasn't that the same period that had the tremendous growth of these innovative and imaginative technology companies?

Mr. PRATT. No, sir. That growth really was generally stifled very much during the seventies.

Of these particular companies; yes. But these companies were financed primarily during the seventies with moneys the venture capitalists already had. If you will look at that, you will see that they did not get new moneys in during that period.

Senator CHAFEE. Did they disburse more than they took in?

Mr. PRATT. Yes. And it's very important to recognize, in the column on the right, that the venture capitalists, while their disbursements went down, did not go down in any relationship to the new moneys coming in or in relationship—and I did not provide that chart here—to the public market.

To give you an idea in the public market: In 1969, 698 companies that had a net worth of \$5 million or less received \$1.4 billion from the public marketplace. In 1974 and 1975, only nine and four companies respectively received only \$16 million each year. That was a total disappearance of investment as far as the venture capital from public market sources. Venture capitalists are long-term oriented, this is what I'm trying to get across.

Let me go on a little bit with some of these numbers and talk about technology-related investment, because I find a great deal of it here in this area.

Interestingly enough, the principal areas in which venture capitalists are investing today are in application software and graphic displays for computers. Now, what are these two areas?

These are the areas that make the computer friendly to dummies like me. They enable me to use the computer. The major area of venture capital investment is applications of the technology and not new technology. You will see they do deal sometimes in genetic engineering, custom semiconductors, and other new technology, but the bulk of the investments are in fact in applications that are expanding the use of this knowledge and information that is coming about in our whole economy.

So I think it is very important to recognize we are not talking about "high technology," we are talking about applications of technology.

Robotics is a particular area. One of the reasons we see increased investment in the Midwest today we think is related to the robotics industry. Why? No business is more applications-driven than robotics. You don't build a robot unless you know what you want it to do. We think that they will be built primarily by people who understand the production process, people in Michigan and Ohio, two of the fastest growing States for venture capital investment in the country today—two of the most economically depressed, but they are getting a tremendous increase in new venture-capital investments.

Now, they can buy robotic technology from Silicon Valley and the software from Route 128, but the companies, we think, will be developed near the production process, and we see this as indicative of business decentralization.

As information is power, we think that as this grows, business is going to be decentralized out more toward application. Where are these things used, rather than where are they being developed? And they are being developed primarily in Silicon Valley and in Route 128.

Another point I want to make—we do a great deal of work for economic development people throughout the country—one of the things that we are trying to get across is let's forget this competition between regional areas.

Our competition, there is no question in my mind, is the Japanese and the Europeans. We in the applications side have an enormous leg up over the Japanese. Why? Because in applications they have language and social problems that are going to be very difficult for them to overcome in software and in applications development. They will be unable to manufacture these things for their own use, and then export them to the United States, in accordance with their previously successful strategy. They are going to have to do something they haven't done before, and that is to start their markets right in the United States. You will see that the Japanese are not a significant factor in microcomputers and in software today. They are significant factors in high technology development.

But again I will stress and stress and stress that applications of technology is what we are talking about here today.

From the viewpoint of user-friendly business, I think there is an interesting story. I had Nolan Bushnell come in to see me last week. You may or may not know him. He is the founder of Atari.

How many people thought people would spend that much on computer games? He then expanded with Pizza Time Theaters, which use robots.

To make technology more friendly, it's interesting what he's doing today. He is now building a company to market a personal robot, your friend "Bob," or your friend "Topo"—you can come home at night, and a little robot would say, "Hey, glad to see you at home. How was your day?" If it was a terrible day, Nolan says you can kick the robot, while you can't kick your dog.

But the robot is making technology familiar and usable to people, which is what I think we have to focus on if we are trying to get into this information and knowledge revolution.

I have discussed the leading points on the geographic distribution in my written testimony and I won't go further than that, because you probably have questions.

I would say, for policy considerations, there are a couple of points I would like to strengthen. One is that the environment is what is the most important thing. If we have an environment that is conducive to risk taking and entrepreneurial development, we will succeed.

We have just completed a major report for a number of British sponsors on how to develop an active venture capital community. They had terrible environmental problems. It is still considered crass to be an entrepreneur involved in making money. The leading thing for the British young person to do is to go into Government or university service.

Senator CHAFEE. We want to rescue them from that fate.

Mr. PRATT. That's right.

Well, we have a big leg up. I was talking to the Japanese and the Germans—we are doing work for both of those people—and they have a terrible problem, because failure is inexcusable in those two countries.

Now, more entrepreneurs have tried and failed than have succeeded. A German journalist told me once, "Well, I will never give you the role models you are looking for." I said, "The media needs to give role models, because success breeds success in entrepreneurship." He said, "We won't do it, because we'd be encouraging failure." I said, "If you don't encourage that way, which brings about success, you are not going to get any success."

So, we have an interest in environment here, and I am asking Congress to maintain that environment. You'll see I have a few specific things to talk about.

Senator CHAFEE. Let's look at those specifics. Are they on page 15?

Mr. PRATT. Yes, sir.

Senator CHAFEE. "Improve incentive stock options for management rewards." We did that a year ago. Did we go far enough?

Mr. PRATT. No, sir. Again, I think some of the others may speak up to that, further.

Senator CHAFEE. The next one: "Long-range investment through a sliding scale of capital gains tax rates to lead to elimination."

Mr. PRATT. I feel it isn't going to do that much good to totally knock out capital gains tax rates. People don't take a long-term investment discipline because they want to or they know it's the

right thing to do. I think we have to get a carrot up there and say, "OK, I like the reductions that there are now, but if you will hold on to this for a longer period of time, exercise some patience, get away from the instant gratification that everybody wants, we are going to reward you by, at the end of 5 years, there will be no capital gains tax."

I think it is extremely important to get some of these carrots out there that are going to try to help build long-term investment businesses.

Senator CHAFEE. Thank you very much, Mr. Pratt. We will have other questions for you.

Our next witness will be Mr. Doan.

[The prepared statement of Stanley E. Pratt follows:]

TESTIMONY OF

STANLEY E. PRATT
President, Capital Publishing Corporation

before the
Finance Subcommittee on Savings, Pensions, and Investment Policy
of the
Senate Committee on Finance

January 19, 1983

Mr. Chairman and Members of this Distinguished Committee:

I am Stanley E. Pratt, president of Capital Publishing Corporation of Wellesley Hills, Massachusetts, specialists in information services and publications related to the financing and development of new and emerging growth businesses. Our Venture Economics division, through a computerized database of more than 3700 companies backed by the organized venture capital community, provides information, research and consulting services related to business development investment to a broad range of major corporate, institutional, investment and governmental clients. These activities are both national and international in scope, and we have also provided data and testimony for a number of government agencies, as well as background for the national and international media. I am also publisher and editor of Venture Capital Journal which has been reporting and analyzing business development investing since 1961. In addition, I am editor of Guide to Venture Capital Sources, now in its sixth edition, which through articles and directories serves to assist entrepreneurs to locate development capital. I have had more than 20 years experience in investment banking, management consulting for smaller businesses and venture capital prior to acquiring the business of Capital Publishing in 1977.

I am delighted to have the opportunity to testify here today, since it is clear to those of us that have worked to improve the business development investment climate that Congress has been a leading factor in recent positive government attitudes and developments. My comments will try to give a brief analysis and survey of the role and nature of venture capital investment and where such investment is employed.

Professional Venture Capital

Perhaps the first question to answer is the most common one asked: what is venture capital? Venture capital is the business of developing new businesses. It is a long-term process in which venture capitalists have direct ongoing involvement with the entrepreneurial management team that is developing the new business. Professional venture capitalists employ a small segment of our nation's capital resources along with their personal experience and expertise to assist entrepreneurs to develop the most productive segment of the U.S. economy. Seeking exceptional long-term investment returns, venture capitalists rely principally upon qualitative judgements rather than the quantitative orientation of most institutional investors. Venture capital covers a wide range of investment interests from startup until the company being developed can attract continuing investment capital from traditional institutional and public market sources.

Venture investment management firms are a specialized vehicle for pension, institutional, corporate and individual investors that cannot give each investment the personal involvement and value-added so critical in

developing "sunrise" new businesses that do not have the experience and management infrastructure of established, "sunset" businesses.

I am sure you are all well aware of the data which shows the disproportionate economic benefit and innovation from small and medium sized businesses. Building vibrant new businesses has become even more important, however, now that the shift from an industrial to an information-based society is happening today, not tomorrow. Our nation is presently a leader in the information-based businesses that may well be the key for successful international competition as markets become global. Information is power and widespread availability of information decentralizes power. International competition, under these circumstances, will require decentralized businesses. No nation on earth has the tools, resources and demonstrated capability of the U.S. to create and develop dynamic new businesses.

Success builds success in a process driven by entrepreneurs, who often view failure as a learning experience. The perception of future rewards, both personal and financial, brings the American entrepreneur and his financial backers into action. In the past five years the organized venture capital industry has grown from \$2.5 billion in committed capital in 1977 to over \$7.5 billion at the end of 1982. Even now, however, this is a tiny segment of our nation's investment capital assets when compared to pension fund assets of more than \$750 billion. Investment disbursements to developing businesses since 1977 total an estimated \$5.8 billion from new and reinvested capital. Venture capital assets are being aggressively employed. The following chart of new capital and disbursement activity

shows the dramatic resurgence of venture capital when the 1978 capital gains tax reduction gave promise of greater net returns from investments with a high risk factor.

Chart 1

Venture Capital Industry
Estimated
Fundings and Disbursements
(millions of dollars)

<u>Year</u>	<u>New Private Capital Committed to Venture Capital Firms</u>	<u>Disbursements to Portfolio Companies</u>
1982 (Est)	\$1,700	\$1,750
1981	1,300	1,400
1980	900	1,100
1979	319	1,000
1978	570	550
Capital Gains Tax Decrease		
1977	39	400
1976	50	300
1975	10	250
1974	57	350
1973	56	450
1972	62	425
1971	95	410
1970	97	350
Capital Gains Tax Increase		
1969	171	450

Source: Venture Economics

The capital inflow and venture capital investment in long-term opportunities expanded dramatically in 1981 and 1982 when recessionary pressures slowed much capital investment. As long as increased present risk is perceived to be compensated by potentially greater future rewards, entrepreneurs and venture investors will remain active.

From this broad background, my testimony will stress:

- the relationship of productivity increase factors to venture capital investment as well as other economic benefit from productive new businesses
- the relationship and importance of technology development to building new businesses
- trends in venture investment by industry and industry segments as well as geographically
- the critical factors for governmental policy considerations
- specific government incentives for consideration

Productivity Increase

There is little question that productivity increase is an important factor in the venture capital investment decision process. While investors may not specifically consider productivity in their business analysis, what better investment is there than in a business in which the end product or service makes the customer more efficient or decreases costs. This is, of course, a reflection of the market orientation employed by venture investors. A study prepared by the U.S. General Accounting Office for a report to Senator Lloyd Bentsen when he was chairman of the Joint Economic Committee, dated August 12, 1982, showed that of 1332 companies in which venture capitalists invested \$1.4 billion during the 1970s, 54% by number

and 61% of the capital was invested in companies which had productivity related products and services. Since Venture Economics was the contractor that developed this data for the GAO, we have taken the liberty of viewing this relationship in 1981 and 1982. The following chart shows that investment in productivity related businesses has increased.

Chart 2
Venture Capital Investment in Productivity Improvement

	<u>1980</u>		<u>1981</u>	
	<u>% Companies</u>	<u>% Amount</u>	<u>% Companies</u>	<u>% Amount</u>
Productivity Related	67%	66%	75%	75%
Non-Related	33	34	25	25

Source: Venture Economics

The GAO study also looked at the other economic benefits created by a portion of the productivity related companies. Since 72 of those firms had established public markets for their securities, the following data was available. With \$209 million in venture capital investment to develop these 72 firms during the 1970s, their combined sales in 1979 alone totaled \$6 billion. Growth in annual sales in the last five years of the decade averaged 33% per year. During the decade of the 1970s these firms created:

- an estimated 130,000 jobs
- over \$100 million in corporate tax revenues
- \$350 million in employee tax revenues
- \$900 million in export sales

Technology Related Investment

While productivity increase appears to be the dominant factor in influencing the venture capital investment decision process, it is technology development that has enabled most productivity improvement. Approximately two-thirds of venture capital investment activity is concentrated in technology related investments. Most of this activity, however, is in applications of technology related to perceived market opportunities, although there are a number of investments which employ the leading edge of technology development. The critical factor is the ability to commercialize innovations since they cannot be effective unless users are willing to purchase and employ the products and services developed. Many of us are wary, and even fearful of high technology and vendors cannot force the use of technology developments. New products must be useful, usable and accepted in such a way that people will adapt to new methods. A concern that must be addressed as we enter a technology driven, information-based society is the effect on employees. Most jobs in high technology generally go to younger new entrants to the labor force. It should be noted, however, that decentralization of businesses, together with the broader availability of knowledge should open opportunities for older and more experienced persons to provide services based upon information utilization.

There has recently been a great deal of interest in tracking the trends of venture capital investment. The entrepreneurial management teams backed by venture capitalists attempt to exploit existing market needs which are expected to develop into major business opportunities. Large established

major corporations are often unwilling and unable to address market niches that may be capable of development into significant opportunities. Venture Economics tracks venture capital investments as a leading indicator of future business trends. Our principal clients are major corporations that recognize the unique ability of young companies to commercialize innovation. It has been demonstrated that clusters of venture capital investment in a new industry, or industry segment, generally precede the emergence of significant sales volume by three to four years. The more aggressive venture capitalists try to initiate opportunities and precede the recognition of these clusters. Venture investors seek future results rather than riding upon past performance. The following chart shows venture capital investment activity in selected major growth industry segments:

Chart 3
Investment Activity in Selected Industry Segments

	1980		1981	
	Number of Companies	Estimated Amount (millions)	Number of Companies	Estimated Amount (millions)
Communications	47	\$ 81	86	\$164
Computer-Related	129	215	212	416
Mini & Micro Computers	25	45	39	134
Graphics	15	27	31	51
Packaged Software	19	25	40	49
Custom Semiconductors	6	35	11	36
Semiconductor Fabrication				
Equipment	7	6	11	30
Genetic Engineering	12	55	36	101
DNA-Agricultural	2	1	6	23
DNA-Industrial	1	1	2	15
DNA-Medical	5	42	14	42
Medical/Health Related	41	60	52	86
Industrial Automation	13	20	34	48

Source: Venture Economics

The significant growth in communications and computer-related investments should be no surprise in view of the pervasive growth of computer usage in today's society. We should particularly note, however, the explosive increases in graphics and packaged software. These are the developments that are making the computer more user friendly and consequently expanding computer usage to a wide range of individuals. While we have only preliminary data on 1982 investment activity, it is already clear that these two segments are continuing to be major growth areas since their recorded 1982 investments (with total data collection only 60% to 70% complete) already exceed 1981's total. Custom semiconductors, semiconductor fabricating equipment and genetic engineering represent areas of investment clearly on the leading edge of technology. While activity in the first two of these segments remains active in 1982, investment in genetic engineering has fallen dramatically. To some extent this decrease is the result of over exuberance in 1981, but continuing support is now often being provided by major corporations. This was a clear case of venture investments pointing the way for large established companies. Medical and health care investments continue to attract venture capital investment. Industrial automation, which includes robotics, continues to be a significant area of interest, although the segment's high growth rate has been slowed by the reticence of major customers to enter into new capital equipment purchases. Venture capitalists, in a number of cases, have been forced to commit additional capital to robotics businesses to support continuing development even when product development has been completed on schedule. This is a graphic illustration of the capabilities and responsibilities of long-term venture investors in emerging new businesses.

Geographic Investment Distribution

The following charts developed from data for the U.S. Small Business Administration - Advocacy Office show the distribution of venture capital investment activity in accordance with the SBA's 10 regions as well as by the 10 leading states.

Chart 4

Distribution of Venture Capital Investment by Region

Region	Estimated Amount Invested (millions)		% Change 1980 to 1981
	1981	1980	
California/Southwest (AZ,CA,HI, NV)	\$ 599	\$ 350	71%
New England (CT,ME,MA,NH,RI,VT)	239	142	68
Gulf Coast/Southwest (AR,LA,NM,OK,TX)	162	132	23
Midwest (IL,IN,MI,MN,OH,WI)	109	82	33
New York/New Jersey (NJ,NY)	80	91	-12
Mid-Atlantic (DE,DC,MD,PA,VA,WV)	65	76	-14
South (AL,FL,GA,KY,MS,NC,SC,TN)	59	54	9
Rockies (CO,MT,ND,SD,UT,WY)	55	68	-19
Pacific Northwest (AK,ID,OR,WA)	33	20	65
Plains (IA,KS,MO,NE)	8	10	-20
Total	\$1,409	\$1,025	37%

Source: Venture Economics

Chart 5

Leading Venture Capital Recipient States

State	Estimated Amount Invested (millions)		% Change 1980 to 1981
	1981	1980	
California	\$ 588	\$ 345	70%
Massachusetts	181	123	47
Texas	139	108	29
New York	45	67	-33
Colorado	43	54	-20
Connecticut	38	7	443
Ohio	36	24	50
New Jersey	35	24	46
Illinois	33	29	14
Pennsylvania	29	42	-31
10 State Total	\$1,167	\$ 823	42%
Other States	242	202	20
Total	\$1,409	\$1,025	37%

Source: Venture Economics

California and Massachusetts, the two states in which a close working relationship has evolved in the past decade between university, business, financial and local government infrastructures, are clearly responsible for their regional performance. It should be noted, however, that Connecticut, which in the past few years has attracted substantial new venture capital investment resources, is a significant contributor to the New England performance. Based upon preliminary data, these three states continue their outstanding activity in 1982. While much of the Texas investment in 1980 and 1981 was related to energy development, we expect a significant shift in 1982 towards technology related investments when the final data has been compiled. New York, with New York City having more venture capital resources than all of California, exports most of its investments to New England, the Gulf Coast/Southwest and California/Southwest regions.

The Midwest region recorded healthy growth in 1981 which appears to be continuing in 1982. It is notable that Ohio recorded 50% growth in this period, as did Michigan. Venture capitalists seem to be finding opportunities in these two states which are most often characterized by their current economic difficulties. In Michigan, our database already records 50% greater venture investment in 1982 over 1981.

While the regional venture investment trends generally confirm the often discussed North to Southwest/West shift in economic vitality, there are obviously encouraging spots of revitalization in the Midwest. I should emphasize, however, that regional competition would be the best way to lose the nation's international advantage. Let us not forget that Japan and Europe are our foremost competitors and our best strategy must be to encourage cooperation between the strengths of each of our regional areas. In noting the cooperation between both venture capitalists and the businesses they back in California and Massachusetts, it is clear that this attitude has contributed to the strengths in both areas.

Factors for Policy Considerations

To build upon our nation's current expertise in knowledge and information-based businesses, the most critical factor for government policy consideration is the fostering of a vibrant entrepreneurial environment. Entrepreneurs are the driving force of new business development and must perceive exceptional rewards for the risk taking that brings unusual accomplishment. The greater availability of knowledge and information should provide increased entrepreneurial opportunity and more effective utilization of talent.

Focus must be placed on building diversity into a balanced economy. Local economic development organizations are now recognizing that a number of dynamic growth businesses provides a more stable economy than dominant industries or employers. We must revitalize rather than reindustrialize. This revitalization can best be accomplished through the types of businesses supported by professional venture capital investment. Most large corporations now recognize that new business development is often better accomplished by independent innovative companies. Much of the recent corporate acquisition activity seems to be motivated by a desire for revitalization rather than diversification. It should be noted that the major number of profit realizations for venture capitalists still comes about through acquisition rather than successful public market offerings. In many cases a larger corporation can efficiently exploit opportunities identified and developed by entrepreneurs.

It is critical to encourage the development of long-term discipline. The current mood expecting instant gratification in our society has seriously weakened our ability to build long-term values. Venture capitalists must generally wait three to five years before they are confident of a successful investment while pension funds and large corporate managers are measured by quarterly performance and stockmarket investors consider themselves long-term if they wait one day before calling their broker. Most successful new business developments are long-term oriented and most wealth created through investment has involved patient disciplines. While recent venture capital activity has provided a dramatic increase in long-term equity capital, there is still a significant capital gap for long-term loans to support continuing business expansion.

While productivity increase is recognized as a major problem for the nation in its international relationships, it also represents one of our greatest opportunities. Effective utilization of increased knowledge and information builds more efficient businesses which provide broad economic benefit and improved life-styles. Increased productivity requires greater long-term investment disciplines which can be stimulated through increased incentives for those who will take long-term risk. Venture capitalists and the entrepreneurs that they back are driven by the expectation of future rewards rather than by short-term current profits.

If government can foster and encourage a favorable environment for new business development, most of the specific actions required can be accomplished at the grass roots. Effective new business development most often results from coordination of local infrastructures from the business, financial and university communities with supportive local government involvement. It is a popular misconception that Stanford and Harvard/MIT were primarily responsible for the Silicon Valley and Route 128 economic miracles. While they were a significant factor, success could not have been achieved without a great deal of support and cooperation from the other sectors of the local infrastructures. Each of these centers built upon their strengths and encouraged entrepreneurs and venture capitalists to create opportunities, which in turn fostered continuing opportunities. As we all know, success is the most powerful force to create future success.

Specific Incentives

In attempting to foster an environment dedicated to change and vitality it is generally most effective to employ overall rather than specifically targeted incentives. In the competition for targeted incentives, established organizations that will normally be opposed to change will generally have the largest voice and in the end gain the greatest benefit. The 1978 capital gains tax reduction was a classic example of this approach, since it applied to all investments but focused increased attention upon those companies that required continuous external capital injections to grow and succeed. The types of incentives that should be most effective in revitalizing the economy will be those that motivate individuals and private sector businesses to overcome the obstacles and do the job themselves, rather than rely upon institutional crutches. Specifically, we would encourage consideration of the following proposals:

- improve incentive stock options for management rewards
- encourage long-term investment through a sliding scale of capital gains tax rates to lead to elimination after a five-year holding
- reduce early tax burdens on new developing businesses through a reduction of income tax rates or deferral until substantial profits have been recognized
- encourage increased pension investment in specialized vehicles for employment in young productive businesses

- provide for greater continuity and adequate funding in the Small Business Investment Company program of the Small Business Administration for increased investment in equity and term loans for small business through this unique government/private sector partnership
- increase direct government assistance through seed grants for scientific and long-term research that will not be driven by current market forces

This nation has a unique resource in its entrepreneurs that, given the proper environment and support, will bring about the needed economic revitalization employing the applications of technology which are increasing the availability and use of knowledge and information. The organized venture capital community is better equipped today to stimulate and support new business development than at any time in the industry's short history. These efforts will take time, however, and it is critical to recognize that long-term benefits require long-term involvement and commitment.

Thank you for the opportunity to address you today.

STATEMENT OF HERBERT D. DOAN, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, DOAN RESOURCES CORP., MIDLAND, MICH.

Mr. DOAN. I am Herbert Doan. I'm Chairman of Doan Resources Corp. in Midland, Mich., and the thing I want to talk about a little bit is Michigan and what's going on there in its business development sense and then make a few recommendations.

A lot of States are working on this business of trying to cause new business generation to occur. And in Michigan the primary mechanism to develop the environment and the understanding and the infrastructure to cause business generation to happen is former Governor Milliken's high technology task force, if you will excuse the words.

Senator CHAFEE. I don't object to the words, I believe there should be a better one.

Mr. DOAN. Well, I do, too. I don't like it either. I think "technology" is better.

The objectives of this high technology task force is to foster a business, political, and social climate in Michigan to encourage the development of technology based businesses to diversify the State's economy.

The environment—Stan Pratt used the word. You do have to have an encouraging positive attitude to cause these things to happen on the part of the State leaders. We don't have that currently in Michigan. There is a lack of understanding, and we are trying to improve that.

Our further objective, more specifically, is 100,000 direct jobs from technology based business generation.

How to achieve this? We have set up three corporations to implement this idea. One of them is the Industrial Technology Institute that we located near Ann Arbor, near the University of Michigan. It will do research and development on factory automation, it will be funded at a level of \$200 million over 10 years—\$50 million of that has come from the State foundations, \$17.5 million from the State government. In the future we hope to get government and industry contracts to keep this institute alive.

The objectives of this institute are to attract the R&D and prototype manufacturing units of large corporations, and we are already seeing that happen. And the more fundamental objective is spin-offs, new business generated from the University of Michigan, or this Industrial Technology Institute, or the industry that surrounds it.

The second corporation is called the Molecular Biology Institute, and will be located at Lansing, near Michigan State University. It will do R&D on plant science, protein structure and function. It will be a biotechnology center for Michigan.

We propose to fund this at \$50 million over 10 years. We have \$6 million of that from the State, and quite a lot of interest from the foundations.

The objective here will be to fund university work, to keep and attract professors. If we don't do something in the Midwest, they will all go to the west coast and to the east coast. We want to make it attractive to them to stay there. It will foster joint university

projects, and the ultimate objective, again, is spin-offs, new businesses.

The third corporation is the Michigan High Technology Task Force, Inc., set up as a corporation. This has as its goals: Increasing capital access to entrepreneurs, which simply means more venture capital groups in Michigan. There are 50 in California; we have five in Michigan. We would like to see that increase to about 15 at least.

We propose to do some educating of entrepreneurs and professionals in how to start a business. We propose to get somebody to publish a newsletter on technology in the State of Michigan. We will also encourage the universities to add to the infrastructure in selected areas.

We have got research hospitals in our State that are really great, and we can encourage them to spin off businesses, if we handle it right.

Senator CHAFEE. What use is the State law permitting 5 percent of the pension funds to venture capital in small businesses if you are restricted by Federal law, the ERISA?

Mr. DOAN. No, we aren't restricted by the Federal law. The Federal law needs clarifying, it's one of my recommendations, but it is permissible now in the State and federally for the pension funds to fund venture capital groups.

Senator CHAFEE. All right, please proceed.

Mr. DOAN. Recommendations? What the Government can do to assist innovative technology based American industry?

I am going to start with a couple that are way back, but I think very important:

First, the Government should support the science infrastructure, and that means support of research universities. Those, along with industry, are our source of technology. They do relate directly to small business, witness Stanford and MIT.

But the research universities are in trouble today. They lack equipment and they need additional research support.

I would recommend increasing the National Science Foundation budget and including an equipment-grant program. I think mission-agencies should increase their funding of university research, and I believe we could do such a thing as requiring 10 percent of mission-agency and federally funded R&D centers' research money to go to university equipment and basic research. And some of that, perhaps, could be administered through the NSF.

In the area of human capital, I think we have, as we all know, a crisis from kindergarten to the Ph. D.'s. This lack of attention to the science and math education at the precollege level is going to catch up with us in a very few years, and one of my submissions to you is the report of the National Science Board Commission on pre-college education in mathematics, and science, and technology. It simply states the problem we've got.

Again, back to supporting universities, the shortage of professors could be helped by research support, research awards to individuals—post-docs, young investigators, and so forth. And I think we should pay some attention to this business of training and retraining.

I have a few other recommendations that have directly to do with small business generation. One of them is the SBIC, small business investment company program of the SBA. And in my submission I have a paper on the value of this program and the venture capital industry. But it seems to me this SBIC program has been a successful Government-private arrangement. It doesn't cost the taxpayer anything; in fact, it returns money to the Government and the taxpayer.

Importantly, it supports a large group of in-place professionals in the venture capital business, particularly the smaller regional venture capital firms. And my recommendations here would be to increase and stabilize the funding, don't overreact to a very few who abuse the system, and then I think we should study ways to take this program private.

In this submission I have a recommendation for what's called the Capital Bank. It could be, initially, Government-funded and become self-supporting. I think this SBIC program could be put into the private sector.

A few comments on tax incentives, and they are ones, Senator, that you have already referred to. We do need to clarify the ability of pension funds to invest in venture capital funds. And strangely enough, pension funds can invest in private partnership venture capital funds, but they cannot invest in corporate forms of venture capital, and I think that's just something that got mixed up in the legislation and should be cleared up. They should be permitted to invest in corporate forms of venture capital.

That's all I have to say.

Senator CHAFEE. Thank you Mr. Doan. Your specifics are most helpful.

You believe that Stanford and MIT were a contributing factor, a help.

And you are saying the same thing about the University of Michigan. It's helpful, but there are a lot of other things involved.

Mr. DOAN. A lot of other things involved, but I think those research universities are absolutely essential to the process.

[The prepared statement of Herbert D. Doan follows:]

UNITED STATE SENATE COMMITTEE ON FINANCE
SUBCOMMITTEE ON SAVINGS, PENSIONS AND INVESTMENT POLICY

HEARING TO PROMOTE HIGH GROWTH INDUSTRIES AND
U.S. COMPETITIVENESS

SENATOR JOHN H. CHAFEE

SUBMITTED BY: HERBERT D. DOAN

Many states are emphasizing their strengths and addressing what is required to achieve the rather sophisticated mix needed to cause new high growth business generation to occur. These are new approaches to regional economic development and diversification.

In Michigan the primary mechanism to develop the environment, the understanding, and the infrastructure to cause business generation to happen is former Governor Milliken's High Technology Task Force. Many more local efforts are also in place.

I. The actions taken by this Task Force have been the formation of three corporations to serve as private/public implementation vehicles:

1. Industrial Technology Institute

- a. Location: Ann Arbor, near University of Michigan
- b. Task: R & D and dissemination of information on factory automation
- c. Funding: \$200MM over 10 years

Foundations: \$50MM committed, goal \$100MM

State of Michigan: \$17.5MM

Future: Industry, government contracts

- d. Objectives: Attract R & D, prototype manufacturing units of large corporations
Spin-offs, new business from U of M, ITI, industry

2. Molecular Biology Institute

- a. Location: Lansing, near Michigan State University
- b. Task: R & D on plant science, protein structure and function
- c. Funding: About \$50MM over 10 years
Foundations: \$200,000 planning money, interest in funding
State of Michigan: \$6MM
Future: Industry, government contracts
- d. Objectives: Fund university work, keep and attract professors
Foster joint university projects
Spin-offs, new businesses

3. Michigan High Technology Task Force, Inc. (see attachment #1)

- a. Objectives:
 - 1. Foster a business, political and social climate in Michigan to encourage development of technology-based businesses to diversify the state's economy.
 - 2. Over the next ten years, assist in the creation of 200-500 technology-based businesses through:
 - a. The development of new technology-based businesses
 - b. Encouraging the growth and development of existing technology-based businesses located in Michigan
 - c. Encouraging the location of out-of-state technology-based businesses in Michigan

3. Cause the creation of 50,000 to 100,000 direct jobs and 150,000 to 300,000 direct and indirect jobs via the fostering of technology-based businesses.

b. Goals

1. Increase capital access to entrepreneurs, more venture capital groups. State law now permits 5% of pension funds for venture capital and small business. Michigan Venture Capital Forum working on increased venture capital. According to the President's Report on Private Sector Initiatives, the Michigan Investment Fund is a pioneering venture capital organization for foundations. (see attachment #2)
2. Educate entrepreneurs and professionals (lawyers, bankers, accountants) in how to develop new business. Michigan Growth Capital Foundation formed to assist this effort.
3. Newsletter to communicate what's going on in state on technology-based business generation. Two experienced journalists preparing a proposal for a newsletter.
4. Encourage universities to add to infrastructure in selected areas:
 - Factory automation -- U of M, ITI
 - Molecular biology -- MSU, MBI, U of M
 - Medical businesses -- Research hospitals
 - Composite materials
5. Attract technology-oriented business
 - Establish research parks
 - Use assets of universities/institutes

II. Government actions to assist innovative, technology-based American industry. Should be geared toward complementing regional development.

A. Most important: Government support of science infrastructure

1. Support of research universities

Underlying research and development on which new industrial growth is based is done in industry and universities.

Universities need:

- a. Equipment
- b. Research support

Recommend:

- a. Increase NSF budget including equipment grant program
- b. Increase mission agency funding of university research
- c. Require 10% of mission agency and Federally Funded R&D Centers research money go to universities for equipment/basic research and administer through NSF

2. Human capital

Crisis from kindergarten to PhD's

Recommend:

- a. Attention to the lack of science and math education at pre-college level (note: NSB Commission on PreCollege Education in Mathematics, Science and Technology, see attachment #3).
- b. Shortage of university professors would be helped by research support, research awards to individuals, post-docs, young investigators, etc.
- c. Encouragement of technology training and retraining

B. Government actions directed at small business generation

1. SBIC Program (Statement on value of the program and on the venture capital industry, see attachment #4)

Advantages

- a. Successful government/private arrangement
- b. No cost to taxpayer--rather demonstrated returns to government and taxpayer
- c. Supports large group of in-place professionals, particularly smaller, regional venture capital firms

Recommendations

- a. Increase and stabilize funding
- b. Don't over-react to a very few who abuse the system
- c. Study ways to take program private. "Capital Bank" initially government funded could become self-supporting (see attachment #4, pg. 15, #8)

2. Tax Incentives (see attachment #4, pgs. 8-20)

Particularly helpful to regional development

- a. Clarify the ability of pension funds to invest "Plan Assets" in venture capital funds (see attachment #4, pg. 9, #2)
- b. Authorize pension funds and endowments to invest in corporate-form venture capital firms (see attachment #4, pg. 9, #3)

- ATTACHMENT 1 MICHIGAN HIGH TECHNOLOGY TASK FORCE
 OBJECTIVES, GOALS AND PLANS
 ACCOMPLISHMENTS AND PROMISES
 THREE CORPORATIONS FORMED AS AN
 OUTGROWTH OF THE TASK FORCE
 MEMBERSHIP
- ATTACHMENT 2 MICHIGAN INVESTMENT FUND
- ATTACHMENT 3 NATIONAL SCIENCE BOARD COMMISSION
 ON PRECOLLEGE EDUCATION IN MATHEMATICS,
 SCIENCE AND TECHNOLOGY
- ATTACHMENT 4 SBIC PROGRAM

MICHIGAN HIGH TECHNOLOGY TASK FORCE, INC.

The Michigan High Technology Task Force was formed to be a leader in fostering a substantial number of jobs in Michigan through the generation of technology-based businesses.

We have developed an outline of action plans needed to achieve the objective of substantial job growth over the next ten years. These plans are complementary to and do not include the large efforts to set up the Industrial Technology Institute and the Molecular Biology Institute.

OBJECTIVES

1. Foster a business, political and social climate in Michigan to encourage development of technology-based businesses to diversify the state's economy.
2. Over the next ten years, assist in the creation of 200-500 technology-based businesses through:
 - a. The development of new technology-based businesses.
 - b. Encouraging the growth and development of existing technology-based businesses located in Michigan.
 - c. Encouraging the location of out-of-state technology-based businesses in Michigan.
3. Cause the creation of 50,000 to 100,000 direct jobs and 150,000 to 300,000 direct and indirect jobs via the fostering of technology-based businesses.

GOALS AND PLANS1. CAPITAL ACCESS

The need is for access of capital to entrepreneurs and small technology-based businesses.

GOALS

- a. Encourage formation of one to three additional venture capital groups each year.
- b. Educate conventional sources of capital (banks and other financial institutions) in venture and other forms of financing technology-based enterprises..
- c. Determine whether Michigan Business Development Corporation is proper way to encourage venture capital and provide funds to technology-based enterprises.

PLANS

- a. Meet with bankers to develop understanding and an exact plan for either direct participation or help in forming venture capital groups on regional basis. Aim for 10-15 venture capital groups by 1985 with total investable assets of \$100-200 million.
- b. Study Michigan Business Development Corporation's charter and revise to a sound, workable plan agreeable to banks and others.
- c. Devise a plan for sensible legislative action to contribute to small business formation (example: R&D credit, Blue Sky Laws).

2. ENTREPRENEURS AND PROFESSIONALS

The need is for education and understanding.

GOALS

- a. Decide on and implement best way to help entrepreneurs understand the methods and resources needed to start a business.
- b. Educate professionals to advise entrepreneurs and become skilled at forming technology-based businesses, as well as developing existing ones.

PLANS

- a. Study methods of educating entrepreneurs and select best for Michigan. Consideration should be given to all regions of the state. Candidate ideas are:
 - The Entrepreneurship Institute
 - MIT Alumni Plan
 - Carnegie-Mellon approach
 - New York University
 - U of M (David Brophy)
- b. Use Ziegleman/Brophy Michigan Growth Capital Foundation as model for educating professionals. Needs to be spread to other regions of state.

3. COMMUNICATIONS

The need is to communicate what is going on in Michigan relating to technology-based businesses.

GOALS

- a. Establish newsletter (magazine) to focus on promotion of technology activities that relate to building a new economic base for Michigan.
- b. Spread the word with seminars.
- c. Recognize success of entrepreneurs through publicity and awards.

PLANS

- a. Study methods, people and funding to start high technology newsletter (magazine).
- b. Decide how to relate to media and all existing publications.
- c. Work up plan to interest corporations in encouraging spin-offs of small businesses.
- d. Develop seminars where appropriate.
Examples: Growth Capital Symposium (David Brophy), Seminar on (C).
- e. Establish awards and publicity for successful entrepreneurs.

4. COLLEGES AND UNIVERSITIES

The need is to add to the technical infrastructure of Michigan.

GOALS

- a. Work with universities to define and give priority to centers of excellence that support chosen areas* for business development.

*Factory automation
Biotechnology and medical
Composite materials

- b. Broaden the role of colleges and universities in fostering economic development.

PLANS

- a. Define centers of excellence at colleges and universities. Call attention to the necessity of the state investing educational funds, preferentially in such centers.
- b. Examine and recommend areas of thrust for the state beyond factory automation and molecular biology.
Examples: Medically-oriented business, composite materials.
- c. Find ways to encourage the involvement of universities and colleges in economic development.

5. ATTRACTING BUSINESS

The need is to improve facilities and ability to attract research and development and manufacturing units of technology-based corporations.

GOALS

- a. Have good technology parks strategically located in Michigan.
- b. Provide leadership to mobilize appropriate resources for calling on major technology-based firms to encourage their location or expansion in Michigan.

PLANS

- a. Development or insure the development of technology parks to encourage location in Michigan of new and expanding technology-based businesses. Determine whether certification of parks would be useful.
- b. Work with all interested institutions--state, universities, local governments to see that proper top level approaches are planned to bring units of technology-based firms to Michigan.

ACCOMPLISHMENTS AND PROMISES

You have the goals of the Michigan High Technology Task Force, Inc. We already have a "track record" and an informal partial list of accomplishments is given below.

Our effort is to build an infrastructure and a climate or attitude in the state which can have a substantial effect on the economy.

1. The Industrial Technology Institute has been formed and has an acting president. This is to be a world-class institute doing research and development on factory automation.
2. The Molecular Biology Institute has been formed and has an interim director to finalize a technical program for the state unique to this expanding technology.
3. The Michigan High Technology Task Force, Inc. has been formed and its goals developed.
4. MHTTF has analyzed the technology park situation in southeastern Michigan. As a result, we have "packaged" a 1,000 acre opportunity in an excellent area.
5. In response to an MHTTF request, a group of professionals (bankers, accountants, lawyers) have organized the Michigan Growth Foundation. The purpose is to bring professionals up to date on the "in's and out's" of working with entrepreneurs and small technology companies.
6. The insights provided by the Task Force projects motivated us to help The University of Michigan get Defense Department funding of \$3.7 million for CRIM--a large and growing factory automation effort within the University.
7. When the Task Force started there were three venture capital groups in Michigan with aggregate assets of about \$20.0 million. There are now six with at least two more being formed. By 1983, it is expected that there will be \$60.0 million resident venture capital in Michigan.
8. U of M's Annual Emerging Business Symposium is entering its fourth year.

Three corporations have been formed as an outgrowth of the High Technology Task Force appointed by Governor William G. Milliken.

The three corporations are:

1. INDUSTRIAL TECHNOLOGY INSTITUTE

An institute devoted to research and development and the dissemination of information on factory automation.

2. MOLECULAR BIOLOGY INSTITUTE

An institute to strengthen Michigan's position in an area of new and significant technology.

3. MICHIGAN HIGH TECHNOLOGY TASK FORCE, INC.

This group will work to develop a climate and infrastructure in Michigan to foster technology-based business. It will work in concert with the Economic Alliance for Michigan.

MEMBERS OF THE MICHIGAN HIGH TECHNOLOGY TASK FORCE

Mr. Herbert D. Doan
Chairman
Doan Resources Corporation

Dr. Paul W. McCracken
University of Michigan

Mr. Herbert H. Dow
Secretary
The Dow Chemical Company

Mr. Robert D. Merrell
Vice President of Manufacturing
and Marketing
Burroughs Corporation

Mr. Max Fisher

Mr. William G. Milliken
Former Governor of Michigan

Lt. Governor Martha Griffiths

Mr. Alan Schwartz
Honigman Miller Schwartz
and Cohn

Dr. William Hubbard
President
Upjohn

Dr. Harold Shapiro
President
University of Michigan

Mr. Joseph L. Hudson, Jr.

Dr. Dale F. Stein
President
Michigan Technological University

Mr. Samuel N. Irwin
President & Chairman
Irwin-Olivetti

Dr. John Weil
Senior Vice President
Bendix Corporation

Mr. Donald R. Mandich
Chairman
Comerica

—Michigan Investment Fund Limited Partnership—

The Michigan Investment Fund has been established as a Limited Partnership to pursue investment policies aimed at business sectors in which new job creation and new economic activity are expected to provide the greatest return on funds invested. The Fund was established as a result of a feasibility study performed by the National Development Council which was funded by the Mott Foundation. The Fund is envisioned as an investment opportunity offering above average returns for its partners in addition to functioning as a development tool to create jobs and help diversify the Michigan economy.

The Fund, still in its formative stages, is expected to achieve a capitalization of between \$8 and \$30 million by early 1983. The current partners in the Fund include the Mott Foundation, the Harvey Randall Wickes Foundation, and the State of Michigan Employee Retirement Systems. Additional foundation and pension fund participants as well as other institutional investors are still being sought.

The management responsibilities for the Fund have been vested in the same people responsible for managing Doan Associates, Michigan's largest venture capital firm. The investment Fund will emphasize technology-based businesses.

A number of other localities are beginning to explore the possibility of creating pools such as MIF to assist in regional economic development. The Fund may prove to be a model for this new form of foundation investment.

Excerpt from: Investing in America, Initiatives for Community and Economic Development,
"The President's Task Force on Private Sector Initiatives," December, 1982.

The United States has by far the best capital markets the world has ever know - the broadest, the most active and the most efficient. One small, but growing segment of those markets is a venture capital industry which is uniquely American.

Professionally-managed venture capital firms foster the birth and growth of businesses which bring new products and services to the marketplace, many of which are high-technology based. These high-growth firms enhance competition, and generate products which expand American export trade.

Twenty five years of venture capital history in the U.S. prove two essential points:

- First, our system of private venture capital firms works extremely well, and has grown rapidly over the past few years; but it remains a miniscule segment of the U.S. economy's \$3-trillion gross national product.
- Second, policies of the Federal Government play a crucial role in the success of venture capital activity; and a series of positive actions can be initiated to stimulate increased venture capital investments in high-growth, technology-based companies.

Growth of the Industry

Our industry has grown tremendously, and, despite the problems plaguing the U.S. economy, venture capitalists, and their portfolio companies, have fared remarkably well in a recessionary environment.

The following table demonstrates this growth:

CAPITAL COMMITTED TO VENTURE INVESTMENTS

	<u>Sept. 1981</u>	<u>Sept. 1982</u>
Private Ven. Cap. Firms	\$2.1-billion	\$3.3-billion
SBICs	\$1.5-billion*	\$1.6-billion*
Corporate Subsidiaries	<u>\$1.4-billion</u>	<u>\$1.7-billion</u>
TOTAL	\$5.0-billion	\$6.6-billion

* -- Includes only SBICs which are venture oriented

(Source: Venture Economics Div., Capital Publishing Corp.)

There has been almost a one-third growth in the industry's capital structure in only one year -- by far the largest dollar infusion in the short history of venture capital.

Fortunately for the American economy, more venture capital is being invested today than ever before. Between 1969 and 1973, U.S. venture capitalist invested about \$400-million a year; from 1974 through 1977 that figure averaged less than \$300-million; 1978 saw \$500-million invested, but the figure doubled to \$1-billion in 1979 and 1980, with a record \$1.4-billion invested in 1981.

The next table gives an insight into the industries which attracted venture capital in 1980 and 1981:

INVESTMENTS BY PRIVATE VENTURE CAPITAL FIRMS

	Percent of Total		Percent of	
	<u>Number of Investments</u>		<u>Dollar Amount</u>	
	<u>1981</u>	<u>1980</u>	<u>1981</u>	<u>1980</u>
Communications	11.4%	11.5%	11.2%	10.9%
Computer Related	30.0	27.4	34.3	25.7
Other Electronics Rel.	14.5	9.6	13.1	9.6
Genetic Engineering	6.2	4.2	11.2	7.6
Medical/Health Related	7.0	10.5	5.8	9.3
Energy	4.9	8.3	5.8	19.9
Consumer Related	4.9	7.5	1.9	3.7
Industrial Automation	6.2	4.5	5.3	2.7
Industrial Products	4.4	3.6	3.4	2.0
Other	<u>10.5</u>	<u>12.9</u>	<u>8.0</u>	<u>8.6</u>
TOTAL	100.0%	100.0%	100.0%	100.0%

To sum up this part of my presentation: the venture capital industry has grown tremendously during the past several years and has invested increasing numbers of dollars in new and growth businesses, many of them in the high-technology area of our economy. This growth has been nurtured in large part by the outstanding performance of professionally managed venture capital pools in the late 1970's.

FEDERAL POLICIES

The General Accounting Office recently studied the relationship between the Government and the venture capital industry and concluded:

"Venture capitalists seek out new technology, entrepreneurial talent, and management resources and combine them for new business opportunities that have significant market growth potential. Compared to the amount of capital invested to create fast-growing, high-technology businesses, this small segment of the U.S. economy has produced disproportionately large benefits to the Nation's productivity and economic well-being. The venture capital process is very sensitive to Government policies, rules, and regulations. Industry and Government should work together to identify pertinent issues and suggest actions needed by either or both sides to create the greatest likelihood of a successful venture capital process in an environment of increasing capital supply."*

Let me give you two examples of how policies of the Federal Government can be crucial to the success of venture capital investment in high-growth companies.

* "Government-Industry Cooperation Can Enhance the Venture Capital Process," a report by the General Accounting Office to the Joint Economic Committee of Congress, August 12, 1982.

When Federal taxes on long-term capital gains were doubled in 1969, the venture capital industry all but died; when that tax rate was cut in half in 1978, the industry flowered. This is illustrated by the following table:

VENTURE CAPITAL INDUSTRY				
ESTIMATED FUNDINGS AND DISBURSEMENTS (Millions of Dollars)				
Year	New Private Capital Committed to Venture Capital Firms	Estimated Disbursements to Portfolio Companies	Public Underwritings of Companies with a Net Worth of \$5 Million Or Less	
			Number	Amount
1981 (Est)	\$1,300	\$1,200	(306)	\$1,760
1980	900	1,000	(135)	822
1979	319	1,000	(49)	183
1978	570	550	(21)	129
Capital Gains Tax Decrease				
1977	39	400	(22)	75
1976	50	300	(29)	145
1975	10	250	(4)	16
1974	57	350	(9)	16
1973	58	450	(69)	160
1972	62	425	(409)	896
1971	95	410	(248)	551
1970	97	350	(198)	375
Capital Gains Tax Increase				
1969	171	450	(698)	1,367
Total Capital Committed to the Organized Venture Capital Industry Estimate at December 31, 1981				
Independent Private Venture Capital Firms			\$2.6 billion	
Small Business Investment Companies			1.6 billion	
Corporate Subsidiaries				
(Financial and Non-Financial)			1.6 billion	
Total			<u>\$5.8 billion</u>	
This pool remained static from 1969 through 1977 at some \$2.5-to-\$3.0 billion (with new fundings more or less equal to withdrawals).				
SOURCE: Venture Economics Division, Capital Publishing Corporation				

"Venture Capital Industry Estimated Fundings and Disbursements" table reprinted courtesy of Venture Capital Journal, Capital Publishing Corporation, Webster Hall, Massachusetts

The second example involves the Small Business Investment Company (SBIC) Program, a unique partnership between the Federal Government and professionally managed venture capitalists.

In 1958, Congress passed the Small Business Investment Act which established the SBIC program, truly the progenitor of organized venture capital in the U.S.

An SBIC is organized by a group of individuals or a parent company; its capital comes from private (that is, non-government) sources; it is privately-managed and makes all its own investment decisions; and, finally, it loses its own money if investments go bad.

The Federal Government, through the Small Business Administration (SBA), licenses an SBIC and sets the general ground-rules under which an SBIC must operate. In return for agreeing to conduct its business under the law and SBA regulations, an SBIC is able to borrow on a long-term basis from the Government.

Over the past 23 years, SBICs have invested more than \$4 billion of equity capital and long-term venture loans in over 60,000 small business concerns. Today, over 360 SBICs, with assets of more than \$2 billion, are actively engaged in the financing of emerging growth companies. In calendar 1981, SBICs invested a record total of \$333 million. From January to June of 1982 -- a six-month high of \$175 million was invested in small concerns by SBICs. Increasing amounts of SBIC financings are taking the form of straight equity or equity with debt characteristics - three-fourths of the investments in the first six months of 1982 were in this category.

In 1980, the SBIC trade association commissioned the international accounting firm of Deloitte, Haskins & Sells and

the economic consulting firm of Arthur D. Little, Inc. to compile and analyze data showing the economic impact of SBIC financing. They concluded that small businesses which received SBIC assistance grew 10 times as fast as the average U.S. small firm in terms of sales, employment, and profits. Clearly, the primary target was utilizing SBIC help effectively.

Deloitte, Haskins & Sells used the same data to arrive at two additional conclusions: first, the SBIC industry was a major money-maker for the Federal Government. The SBIC program cost the Government \$4-million in 1979; half of this covered administrative expenses, the other half covered losses sustained on loans to SBICs which went broke. In return for that \$4-million, the Treasury received \$440-million in increased taxes from SBICs, their portfolio companies and employees. That is surely a remarkable cost-benefit ratio. Finally, DH&S found that the SBIC program created a permanent new job in the private sector at a cost to the Government of only \$312 -- again an unbelievably low figure when contrasted with any other Federal job-creation program. I would be pleased to submit copies of these studies for the record.

RECOMMENDATIONS

Recent tax and security changes have improved the environment for the formation of venture capital pools and for investment in high risk, new technology firms with potential for rapid growth.

Yet, observers of the venture capital field estimate a potential venture capital shortfall ranging from \$5 billion to \$40 billion.

So, there is a substantial need for additional tax policy initiatives to further increase the availability of venture capital for high-growth firms.

Let me suggest to you the following ten point program for your consideration:

1. Corporate Capital Gains Tax - Congress should amend the Code to put the effective capital gains tax rate for corporations in parity with the maximum capital gains rate for individuals. This action requires two steps - a reduction in the nominal rate from 28% to 20% and a concurrent removal of the untaxed portion of net realized long-term capital gains from the list of preference items for purposes of the corporate add-on minimum tax. These steps would make high-risk investments significantly more attractive to corporate-form venture capital companies (including SBICs) and corporations which are partners of partnership-form venture funds; and it would draw significantly more capital into the venture investment field from corporate sources.

2. Clarify the Ability of Pension Funds to Invest "Plan Assets" in Venture Capital Funds - The level of pension funds flowing into venture pools has grown significantly in the past few years; from approximately \$1 million in 1977 to \$228 million during the first six months of 1982. This increased level of fund flows has taken place under a proposed regulation issued by the Department of Labor under ERISA on June 6, 1980. That proposed regulation defines pension fund "Plan Assets" in a manner which enables pension funds to invest in venture pools while avoiding the problems of venture fund managers being considered plan fiduciaries or venture pool assets being considered plan assets. While the current regulation needs several technical improvements, the more important issue is the need for long-term certainty that pension funds may clearly invest in venture pools under ERISA. In order to insure the continued flow of pension funds into venture capital pools your Committee should express to the Labor Department its interest in obtaining certainty on this issue; and, if Labor's final regulations do not achieve this objective, consideration should be given to amending the Employee Retirement Income Security Act (ERISA).
3. Authorize Pension Funds and Endowments to Invest in Corporate-Form Venture Capital Firms - As a practical matter, pension funds and endowments are effectively

prohibited from investing in SBICs and venture capital pools which are organized in corporate form. This results from the IRS's interpretation of Section 542(c) of the Code which says, in effect, that if such a venture fund or SBIC used borrowed funds to make investments, that share of distributed earnings or dividends related to the borrowed funds must be treated as taxable "unrelated business income" by the endowment or pension fund. We do not believe the proscription in the Code was intended to achieve this kind of negative effect on venture capital investments, and it should be corrected to give corporate-form venture funds and SBICs parity in access to pension fund and endowment sources of capital. This correction can be achieved by either an exemption in Section 542(c) of the Code, or an amendment to the definition of what constitutes "unrelated business income."

4. Repeal or Re-Direction of Section 385 (Debt-Equity) Regulations - I need not go into great detail with your Committee on the subject of Treasury's proposed Section 385 Regulations relating to whether an interest in a corporation is to be treated as debt or equity. The Chairman's legislation, S.2610, to repeal those rules was right on target. If the Treasury Department once again proposes debt-equity regulations which are unreasonable, excessively complex and will impair the continued growth of American small business, then the

Congress should either repeal Section 385 or, in the alternative, clarify Treasury's duty to provide only general guidelines consistent with Congress' original intent, rather than a rigid set of formulas and arbitrary rules.

5. Full Restoration of Incentive Stock Options -The Economic Recovery Tax Act of 1981 introduced Section 422A of the Internal Revenue Code entitled Incentive Stock Options ("ISO"). The intent behind the introduction of the ISO was to provide corporations with an incentive device for attracting new management and retaining the services of key executives. This is accomplished by providing these executives an opportunity to acquire an equity interest in the business, thereby instilling the incentive to help build a successful enterprise with an expanding and improving profit position.

Several modifications to the ISO provisions could significantly assist small growth businesses.

Eliminating the sequential exercise rule of Section 422 (b)(7) will allow a key executive of a small business to select the best option, which in turn increases the effectiveness of the ISO in attracting qualified personnel. In this regard, the management personnel of small business often times receive minimal salary and bonuses, and forgo other compensation opportunities in order to assist an emerging enterprise through its growth stage.

Additionally, the \$100,000 limitations of Section 422(b)(8) should be substantially increased. That provision provides that the term "Incentive Stock Option" means an option granted to an individual in connection with his employment but only if the aggregate fair market value of the stock for which the employee may be granted in any calendar year does not exceed \$100,000. An amendment which raises the \$100,000 limitation would permit cash strapped small businesses to attract qualified personnel without paying currently the salary and bonuses commensurate with their abilities. Small growth enterprises historically have been disadvantaged vis-a-vis large firms given the higher risks and their reduced ability to offer competitive salary, bonuses, perquisites and other benefits.

Finally, the provision in the Tax Equity and Fiscal Responsibility Act of 1982 which makes an incentive stock option an item of tax preference for computing the alternative minimum tax should be abolished. Incentive Stock Options to be effective must be large enough to attract desired personnel, must be flexible enough to achieve the desired results, and must not have an immediate tax impact. The employee attracted by the ISO rarely has significant cash reserves to pay the required tax associated with the exercise of the option. Since exercise of the option may be cost prohibitive, this

provision would detract from the incentive to associate with an emerging growth company. Delay of tax liability until the recipient sells the stock underlying the option, and can thereby raise the cash needed to pay the tax, is critical.

6. Amend Sub-Chapter M of the Code to Give 1980 Act "Business Development Companies" Pass-through Tax Treatment - The Small Business Investment Incentive Act of 1980 amended the Investment Company Act of 1940 to establish a new system of regulation for certain closed-end investment companies that provide capital and make available significant managerial assistance to small growth firms. Those investment companies can elect to be treated as business development companies giving them greater flexibility than other investment companies in dealing with portfolio companies, issuing securities and compensating management.

The 1980 Act did not conform subchapter M of the Internal Revenue Code to allow conduit tax treatment to the shareholders of a BDC under the same rules as are applied to a regulated investment company.

This poses a dilemma for a company that already is eligible for conduit treatment. It can either remain a regulated investment company, which is subject to the system of regulation applicable to most investment companies but receives conduit tax treatment, or it can elect to become a "business development company," which

is subject to an alternate system of regulation but is not eligible for conduit tax treatment.

Conduit tax treatment, particularly the elimination of the double tax on capital gains is of considerable importance to companies that specialize in venture capital investments. The absence of conduit tax treatment is clearly restricting Congress' effort to promote investment in small business inasmuch as only a small number of BDCs have been established since 1980.

7. Creation of a New "Small Business Participating

Security"- More effort is needed to attract both institutional and other investors to invest in high-growth firms. Many of the factors that inhibit such investments can be minimized through the development of specifically designed investment vehicles.

A "Small Business Participating Security," a hybrid form of security that would offer both a fixed rate of interest and a percentage of profit to the investors, should be adopted. Such a security would include such tax features as:

1. Capital gains treatment on the investors' profits;
2. Deductibility by the small business of both the profits and interest paid out on the securities; and
3. An investment tax credit to the investor for such investment.

The Small Business Participating Security ("SBPS") could help to satisfy the financing needs of small growth companies by attracting new individual and institutional investors. There could also be a substantial amount of institutional involvement in the sale of SBPSs. Certain banks and insurance companies have expressed interest in the SBPS concept. It is also expected that broker-dealers could sell participation interests in one SBPS or in several SBPS investments whereby investor risk would be reduced through diversification. Pooling of several SBPS investments would also make them more appealing to institutional investors. A proposal to authorize this new form of security was introduced in the 97th Congress in S. 360. In our view this proposal would generate capital investment, new jobs and additional federal revenues; and, unlike many federal programs, there would not be any risk of loss to a government agency.

8. Establish a Federally Chartered, Privately Managed "Capital Bank" to Provide a Secure and Stable Source of Funding for the SBIC Industry - In order to satisfy the future funding needs of SBICs, a privately-managed, quasi-public "Capital Bank" should be established to provide a continuing source of leverage funds for the SBIC industry. The bank, which would be federally chartered, would be similar to existing entities, such as the Federal National Mortgage Association and the National Consumer Cooperative Bank.

The SBIC capital bank could have the following principal features:

- a. It would be privately managed and would utilize the resources and techniques of the private sector once it is established and operational.
- b. It would be initially capitalized by the U.S. Treasury at the level of \$100 million. This would represent a one-time, non-recurring investment by the Federal Government.
- c. The Treasury investment would be retired over time out of profits earned by the bank. The bank's income would be derived from spreads on its loans, investment income and service fees.
- d. SBICs would be obligated to purchase "participating" stock in the bank.
- e. The bank would be authorized to issue its own securities (notes, debentures, stock) in conventional financial markets.
- f. On a phased basis, the bank would become an institution owned by persons in the private sector.

Recent budget cuts have limited the authorized funding for the SBIC program for fiscal 1982 and 1983 to a maximum of \$160 million per year. These restrictions in the availability of leverage occur at a time when the need and demand for leverage have increased. Rapid growth of the industry over the past several years, an

increased rate of demand for venture capital and the roll-over of maturing SBIC loans, which must be taken out of annual appropriations, have escalated the SBIC industry's need for leverage. Accordingly, there is a need to establish a stable source of continued funding support, such as a Capital Bank, for the SBIC program.

9. Provide a 10% Investment Tax Credit for Investments in "Qualified Small Business" - Congress should amend the Internal Revenue Code to provide an investment tax credit, equal to 10% of funds invested, for investment in a "Qualified Small Business Investment" (QSBI), and the capital gains tax shall be deferred on the portion of the capital funds which are reinvested in a QSBI within a certain period of time.

A "Qualified Small Business Investment" would be an equity security or debt, instrument issued by a Small Business Investment Company, Business Development Company, or a small business as determined by reference to the SBA small business size standards for SBIC investments.

The goals of this legislation would be twofold:

- a. to attract new capital to small businesses through the investment tax credit; and
- b. to encourage funds already committed to small business investments to be reinvested in such companies when the original investment is

liquidated. The tax deferral also would increase the amount of funds available for reinvestment when the source of funds is a capital gain transaction.

The predominant advantage to this type of proposal include the following. The capital gain tax deferral would provide incentive to investors in a qualifying enterprises to roll-over their portfolios more often and reinvest the proceeds of the sales in other qualifying enterprises, the effect of which would be increasingly greater capital committed to the rapid growth sector of the economy. The provision would reduce the tax Code's inducement to owners of small growth firms to sell out to large corporations, whose shares are actively traded, in tax-free reorganizations so that they can postpone capital gains tax on the sale. Further, small businesses that approach potential investors for funding would be assisted by such legislation. Banks, SBICs, venture capital funds, and other institutional lenders would benefit from the incentive of the tax credit and from the tax deferral. Individual investors now investing funds in tax shelters or money market funds would have greater incentive to invest at least a portion of their funds in small business. Owner-investors would be able to commit greater amounts of funds to their businesses. New investments stimulated by this legislation would result in the creation of new

jobs and, ultimately, increased tax revenues from both the businesses and newly employed workers.

10. Amend the Code to Provide an 80% Exclusion for Gains Realized on Equity-Type Investments in a Small Business which are held for more than 5 year - Congress should amend the Internal Revenue Code to provide that after holding an equity or equity-type investment made directly in a small growth business for more than five years, the seller of such an investment would be entitled to exclude 80% of any gain realized on such investment.

Current law regarding the taxation of long-term capital gains requires that an investment be held for more than a year before the investor qualifies for lower tax rates on his profits from investment.

In the interest of rewarding realized gains accrued over an extended period, which is a primary purpose behind long-term capital gains treatment, consideration should be given to establishing a two-tiered holding period system with the capital gains deductions increasing to 80% if the investment is held for five years.

The advantages to establishing this type of system are several. First, the system would introduce a better balance between risk and reward. Second, the system would spur risk-taking and encourage longer term investments, which are the type needed for development and growth. Third, investment in new and small

businesses would be promoted since realization of gains from such venture capital investments require an extended holding period. Fourth, since investors would have greater incentive to realize longer term capital gains than current income, businesses would be encouraged to plow back earnings to achieve greater growth rather than disbursing their earnings to pay dividends. Fifth, to the extent equity financing is more readily available, the debt-equity ratio on corporate balance sheets should improve, thereby reducing the risk associated with the investment.

Today's Problems, Tomorrow's Crises

Introduction

Across the United States, there is escalating awareness that our educational systems are facing inordinate difficulties in trying to meet the needs of the Nation in our changing and increasingly technological society. We appear to be raising a generation of Americans, many of whom lack the understanding and the skills necessary to participate fully in the technological world in which they live and work. Improved preparation of all citizens in the fields of mathematics, science, and technology is essential to the development and maintenance of our Nation's economic strength, military security, commitment to the democratic ideal of an informed and participating citizenry, and leadership in mathematics, science and technology.

To meet these ends, our formal and informal education systems must have the commitment and the capacity to achieve three equally important goals:

- to continue to develop and to broaden the pool of students who are well prepared and highly motivated for advanced careers in mathematics, science and engineering;
- to widen the range of high-quality educational offerings in mathematics, science and technology at all grade levels, so that more students would be prepared for and thus have greater options to choose among technically oriented careers and professions; and
- to increase the general mathematics, science and technology literacy of all citizens for life, work and full participation in the society of the future.

The first goal needs little explanation, since maintenance of U.S. scientific and technological capacity requires superbly educated mathematicians, scientists, and engineers. As the total number of 18-year-olds in the population continues to decrease into the 1990's, the percentage of high school graduates entering preprofessional, college-level courses in science and engineering must increase to meet future manpower needs. In addition, to meet the country's needs for excellence, creativity, and innovation in its scientific work, we must develop and utilize the talents of all Americans, including women and minorities (now currently underrepresented in the science and engineering professions).

The critical value of the second goal has become widely recognized during the past few years. The current gap between opportunities for those with and without credentials in mathematics, science and technology will increase dramatically as the technological complexity of U.S. society increases. Industrial leaders have identified the current shortage of trained technicians as a serious barrier to increased productivity. Military commanders echo this concern about their manpower requirements for meeting national security needs. In such professions as law, journalism, and business management, there is also a growing demand for men and women with backgrounds in mathematics, science, and technology. The current and increasing shortage of citizens adequately prepared by their education to take on the tasks needed for the development of our economy, our culture, and our security is rightly called a crisis by leaders in academe, business, and government.

The third goal is rooted in Thomas Jefferson's familiar dictum that an educated citizenry is the only safe repository of democratic values. The life and work of Jefferson and others make clear that a broad understanding of the relationships between science and society was considered by early Americans as integral to the ideal of the Republic. To lead full lives and to participate with confidence in contemporary American society, citizens need an understanding and appreciation of mathematics, science and technology.

This report reviews the status of math, science and technology instruction in our educational systems and explores some of the key problems and challenges facing those systems. The central conclusion to be drawn is that, in the aggregate, the U.S. educational systems currently are not satisfactorily achieving the second and third goals, and they will need assistance, although perhaps to a somewhat lesser extent, to meet the first.

**The Principal
Concern:
Declining
Achievement
and Participation
at a Time of
Increasing
National Needs**

Data from a number of sources have documented declining student achievement in mathematics and science, as indicated by declines in:

- science achievement scores of U.S. 17-year-olds as measured in three national assessments of science (1969, 1973, and 1977);
- mathematics scores of 17-year-olds as measured in two national assessments of mathematics (1973, 1978); the decline was especially severe in the areas of problem-solving and applications of mathematics;
- mathematical and verbal Scholastic Aptitude Test (SAT) scores of students over an 18-year period through 1980; and
- students prepared for post-secondary study. Remedial mathematics enrollments at four-year institutions of higher education increased 72 percent between 1975 and 1980, while total student enrollments increased by only seven percent. At public

four-year colleges, 25 percent of the mathematics courses are remedial; and at community colleges, 42 percent are.

The proportion and qualifications of high school seniors who will major in mathematics, science, and engineering have remained roughly constant over the past 15 years, although college engineering enrollments have increased steadily since the mid-1970's. Some students are also receiving more advanced experiences in secondary school science and mathematics as indicated by performance on advanced placement tests.

Nonetheless, adequate mathematics and science course opportunities are not available for *all* talented and motivated students. As many as one-third of U.S. secondary schools do not offer sufficient mathematics to qualify their graduates for admission to accredited engineering schools. Only one-third of the 21,000 U.S. high schools teach calculus, and fewer than one-third offer physics courses taught by qualified physics teachers.

The evidence on student participation and achievement indicates a wide and increasing divergence in the amount and quality of the mathematics, science and technology education acquired by those who plan to go on to college and study in those areas and by those who do not. Students in the latter category generally stop their study of mathematics and science at a relatively early age, perform considerably less well on achievement measures than the career-bound, and do not have opportunities to pursue appropriate courses in contemporary technology. Only nine percent of the students graduating from vocationally oriented secondary school programs in 1980 took three years of science, and only 18 percent took three or more years of mathematics. Hence, it is clear that while the first goal stated in the introduction presently is being fulfilled reasonably well, the second and third goals are not. In fact, the educational system may actually have carried out these latter goals better 20 years ago: the proportion of public high school students (grades 9 to 12) enrolled in science courses has declined since that time. Thus, the principal concern with student participation and achievement is with those who do not plan careers in mathematics, science, or engineering.

In addition, wide differences persist in achievement and participation levels among students from different social groups. Women have traditionally participated less than men in science, and members of various minority groups (specifically, if not exclusively, American Indians, Black Americans, Mexican Americans and Puerto Ricans) have participated less and performed less well on standard science and mathematics achievement tests than their white counterparts. Approximately 20 percentage points separated the mathematics achievement scores of 17-year-old black and white students on national assessment tests in both 1973 and 1978. Ap-

Specific Contributory Problems

proximately 15 percentage points separated 17-year-old Hispanics and whites in both years. Between 1973 and 1978, nine-year-old black students showed a definite improvement in performance on mathematics achievement tests, while the average performance of nine-year-old white students declined and that of Hispanics remained constant.

Studies and analyses of conditions in the U.S. educational system—including both its formal and its informal components—point to four problems that contribute to declining student participation and achievement levels.

Teachers

Individual teachers have considerable discretion in the selection of course content and instructional approaches and, therefore, play a pivotal role in the education of students. Superior teachers of mathematics, science and technology can motivate students to do well in their courses and can stimulate students to take more advanced courses and consider technically or scientifically oriented careers. Mediocre and poor teachers may dampen the enthusiasm of good students and fail to recognize and stimulate the development of potential talents in others. Therefore, the documented shortage of superior teachers must be considered a prime contributing cause of decreasing student participation and achievement in mathematics, science and technology.

There is also a growing shortage of qualified secondary school mathematics and physical science teachers. In 1981, 43 states (of 45 responding) reported a shortage of mathematics teachers. For physics teachers, 42 states reported such shortages. In the same year, 50 percent of the teachers newly employed nationwide to teach secondary science and mathematics were actually uncertified to teach those subjects. From 1971 to 1980, student teachers in science and mathematics decreased in number—threefold in science and fourfold in mathematics—and only half of them have actually entered the teaching profession. In addition, 25 percent of those currently teaching have stated that they expect to leave the profession in the near future.

Some of the problems that affect the participation and achievement of students at all grade levels are:

- Among certified teachers of high school mathematics and science, very few have had the formal educational preparation required to provide students with an understanding of modern technology.
- There are few available opportunities for certified mathematics and science teachers to update or broaden their skills and backgrounds. Such training opportunities are essential due to the rapid advances taking place in mathematics, science and

technology and the need to introduce new types of upper level courses for nonspecialists.

- There are few inservice programs to certify teachers who are presently not qualified to teach mathematics and science.
- Most teachers in the primary and middle school grades have not had training in science and mathematics or courses in methods to teach these subjects.
- District-level supervision has been reduced as a result of financial retrenchment or has been shifted from instructional to administrative support. As a result, relatively few people are available outside the classroom to provide quality control or to assist teachers with pedagogical problems.

Classrooms

Deficiencies in the numbers and qualifications of mathematics and science teachers are exacerbated by classroom conditions, including inadequate instructional time, equipment, and facilities.

The time available for adequate instruction in U.S. schools is far more limited than in other advanced countries. In the United States, the typical school year consists of 180 days, as contrasted with 240 days in Japan. This is further reduced by absenteeism, which amounts to an average of 20 days per school year. The typical school day is five hours long, compared with six- or eight-hour days in other countries. In addition, many periods of varying length throughout school days and weeks are devoted to non-academic pursuits, both reducing the hours available for instruction and diverting the time and energy of teachers to noninstructional duties. Problems associated with student discipline and motivation, which are severe in some schools and affect the general learning environment, have been well publicized.

Many science courses in schools throughout the country are being taught without an adequate laboratory component or with no laboratory at all. In some cases, laboratory apparatus is obsolete, badly in need of maintenance, or nonexistent. In other cases, such apparatus is not used because of a lack of paraprofessionals or aids to set up and maintain equipment, a condition that has become increasingly important due to the greater concern for safety in the schools.

Curricula

Curricula in mathematics and in several scientific disciplines were developed with federal support two or more decades ago to provide rigorous, modern course work for high school students interested in careers in mathematics, science and engineering. These curricula, and several generations of privately-developed successors, continue to serve their purpose, though many need to be revised.

Mechanisms must be developed to incorporate effectively into the curricula changes associated with advances in the disciplines and evolving contemporary technologies.

Another curricular concern is that upper level high school courses based on these curricula are too abstract and theoretical for most students. In fact, serious doubts exist about whether many of the commonly offered mathematics, science and technology courses in the secondary schools are, in their present form, of much value to students planning careers outside of mathematics, science or engineering. Few courses or widely accepted curricula are available with the explicit aim of providing such students with adequate preparation in mathematics and science. In addition, courses associated with modern technology are not available; most courses, in fact, make little reference to technology at all.

In the lower grades, mathematics courses emphasize basic computational skills rather than interpretation and application. Science courses at those levels often are empty of content and, generally, do not build upon the work of previous grades.

Appropriate courses in modern technology are not available. Few systematic attempts are made to integrate learning in mathematics, science and technology. As a result, little coherent preparation is offered for the disciplinary courses (usually earth science and biology) encountered for the first time in the ninth and tenth grades. This condition is particularly unfortunate, because a wealth of information supports the conclusion that students who dislike mathematics and science courses in the early grades, or who receive inadequate instruction in those grades, are unlikely to participate effectively in upper level courses.

Instructional Approaches

In general, precollege mathematics, science and technology instruction has yet to take advantage of the advances in technology and behavioral science of the past 20 years. For example, computers provide an immense opportunity to develop curricula and instructional approaches that might motivate larger numbers of students and increase the flexibility of the programs available to them. Computers and other modern technologies are available in many U.S. schools, and imaginative uses are made of these instructional aids in individual classrooms. However, computer software is generally inadequate, and the full potential of these technologies for instruction has received little attention.

Considerable progress also is being made in research in math and science education. The cognitive sciences are providing a wealth of information on the way people learn. For example, knowledge is now available about the relative degree of abstraction that students of a particular age can be expected to grasp. However, such information has yet to be systematically applied either in the

development of mathematics, science, and technology curricula, or in the training of teachers of these subjects.

Finally, there is evidence that many students who have an interest in mathematics, science, and technology are not being reached through instructional approaches currently used in the classroom. Whereas many students do not like school science—and form this opinion by the end of third grade—many do like the science and technology that they see on television. They also like what they encounter at science and technology museums, planetariums, nature centers, and national parks. Many of these institutions facilitate science and technology education with their own after-school, weekend, and vacation classes. In addition, many school classes make field trips to such institutions. Because these programs are apparently more appealing than school science offerings, the innovative instructional approaches used in them should be examined and, where possible, applied to the classroom setting.

Public Perceptions and Priorities

Largely, public schools reflect, rather than determine, public perceptions and priorities. The condition of mathematics, science and technology education reveals an apparent misperception by the public that adequate course work need only be provided to students preparing for college-level study in these fields and that these courses are unnecessary for other students. This is consistent with the broader perception that excellence in science and technology is vitally important to the Nation but that it can and should be left to the experts. Thus, its pursuit has little to do with the day-to-day concerns of most people—except when major news events such as a nuclear reactor accident or a space shuttle launch intrude. This misperception about the mathematics, science and technology training needed by students in our schools is tragic for our society as a whole.

Yet, a reasonable fraction of the adult public is interested in science and technology. This is evident from the recent popularity of science magazines for nonspecialists, quality television and radio programs (particularly in the public media), and science and technology museums. Although a large fraction of the public enjoys science and technology, it appears that many consider school mathematics, science, and technology as isolated from the real world and not essential for most students.

That misperception is part of a public view that the aims, substance, and quality of public education do not reflect the considerable economic, social, and cultural changes that have occurred in this country since the late 1960's. Today, an increasing percentage of the work force is concerned with the retrieval, processing, and transmission of information. Yet, public school mathematics and science courses are, at best, only peripherally concerned and preparing students to work and live in a society that concentrates on such tasks.

Apparently, no consensus has been reached that the future prosperity and international position of the United States depend critically upon broader public attainment in mathematics, science, and technology. In addition, there is no consensus that high quality mathematics, science, and technology education is a matter of national concern, transcending state and local interests and responsibility. Mathematics and science requirements both for high school graduation and for college entry have generally declined over the past 15 years. Although there are some encouraging signs that this trend is reversing, only about one-third of the Nation's 16,000 school districts require more than one year of high school mathematics and one year of science for graduation.

National Science Board Commission

The absence of a national consensus on the importance of mathematics, science, and technology education for all citizens may be the central cause of the critical problem facing our educational systems. A broad national effort is essential. The National Science Board Commission on Precollege Education in Mathematics, Science and Technology has been established to address this condition. The Commission will define, over the next year, a national agenda that should provide an action plan for all sectors of society to use in the achievement of the three important educational goals outlined in the introduction to this report.

Sources

The data appearing in this report have been drawn from the sources that follow. Specific citations and additional references may be obtained on request from the office of the National Science Board Commission on Precollege Education in Mathematics, Science and Technology.

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2. National Science Foundation. *Science and Engineering Education: Data and Information 1982. A Report to the National Science Board Commission on Precollege Education in Mathematics, Science and Technology* [NSF 82-30].
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Senator CHAFEE. Mr. Morgenthaler.

**STATEMENT OF DAVID T. MORGENTHALER, SENIOR PARTNER,
MORGENTHALER ASSOCIATES, ON BEHALF OF THE NATIONAL
VENTURE ASSOCIATION**

Mr. MORGENTHALER. Thank you very much, Mr. Chairman. It's a privilege to be able to appear before you today, and I'm particularly delighted to see Congressman Zschau present, who has made huge contributions to the program I am going to talk about; in fact, he was probably the individual most singly responsible in 1978 for improving the situation of the venture capital industry and entrepreneurship.

My name is David Morgenthaler. I will give you a very brief summary of the longer remarks that I have submitted to you and would be very happy to have a chance to amplify those if you would like.

I am a senior partner of Morgenthaler Associates, which is a private venture capital firm. I am a director of a number of companies which are principally involved in high technology. I am also a past president and past chairman of the National Venture Capital Association.

Senator CHAFEE. Where are you from? Did you say California?

Mr. MORGENTHALER. No, sir. I am from Ohio.

Senator CHAFEE. Ohio?

Mr. MORGENTHALER. Yes, sir. I live in the middle of the depressed States, and we have been working on a program for Ohio and have been creating companies in places including our friend Ted Doan's State of Michigan.

Senator CHAFEE. Mr. Pratt mentioned there is hope for Ohio, too.

Mr. MORGENTHALER. I'm very hopeful, particularly if we can get some of the things done that we are talking about.

When they asked me on this panel, along with the current leadership of the National Venture Capital Association, I asked what I could offer that would be different, and I was told that my role was to provide a viewpoint of one who had both long experience in this field and a somewhat different kind of experience, because I'd been both an entrepreneur and a venture capitalist, and I helped found my first company as a member of an entrepreneurial team back in 1945. We founded what became a successful manufacturing company. In that process, Mr. Chairman, I found out what life was like without the venture capitalists that exist today, because we had no such institutions at that time.

I subsequently was a manager of several small rapidly growing companies in technology fields, and then I later served as president for 11 years of a company that was financed by a major venture capital firm. In other words, at that time I found out the goods and bads of people such as my fellow panelists today, my good friends Mort Collins, Ted Doan, Mike Bell, who will be here, and such as the kind of guy I've been for the last 15 years.

Fortunately, I had a great group of venture capitalists. And this was a very considerable improvement over 1945, when there were no such institutions.

Fortunately, this worked out well enough that both the venture capitalists and I sold out in the late 1960's, and I had accumulated enough personal capital to finance my own venture capital firm.

When I talk about stock options, Mr. Chairman, I have vivid personal experiences of servicing the bank debt that it took to exercise these while I was supporting a growing family. And based on such experiences, as well as the difficulty of financing companies in the early and mid-1970's, I was the cofounder of the incentives program of the National Venture Capital Association. This activity was a forerunner of much of the activity which led to the various reforms beginning about 1978 that have done so much to stimulate the emergence of the new high-growth industries.

As indicated, I also have been very active in the last 10 years in various programs that attempt to stimulate entrepreneurship and high technology amidst the mature industries of our own State of Ohio. And this has been a very difficult thing to do.

Today I genuinely feel that entrepreneurship and venture capital are currently one of the brighter spots in our rather gloomy economy, almost entirely as the result of the reforms that have been accomplished since the mid-1970's.

The process of forming new businesses is both complex and fragile. It can easily be damaged by unintended effects of government actions, which becomes very clear when you review actions of 1968 and 1976 with the benefit of hindsight.

My summarized recommendations for actions and policies to preserve and enhance the present climate for the formation of businesses are as follows:

1. Make sure that what we have accomplished since 1978 is not eroded. You raised a question a little earlier about the incentive stock-option program created by the tax bill of 1981. The tax bill of 1982 did a great deal of damage to that ISO program created in 1981 and has undone much of the good effect of the 1981 legislation.

Senator CHAFEE. Let's be specific.

"An example is the damage done by the 1982 Tax Bill to the new ISO"—what does that stand for?

Mr. MORGENTHAUER. Incentive stock option program.

Senator CHAFEE. How has it been changed?

Mr. MORGENTHAUER. By including it as a preference item. The original bill, we believe, made a fundamental mistake by putting a cap of \$100,000 on it, which is often too small to attract people to smaller companies, especially to try to save them when they get into difficulty. A hundred thousand dollars is too small an amount.

However, when ISO's were included as a tax preference item, much more damage was done to the program.

Senator CHAFEE. By bringing them in for the minimum tax?

Mr. MORGENTHAUER. Yes, sir. As an alternative minimum tax.

Senator CHAFEE. What would you do?

Mr. MORGENTHAUER. We would simply eliminate the provisions in the 1982 tax bill; take it back as it was in 1981 and eliminate the cap, the \$100,000 limit on it.

It's extremely important that we test all regulations that are promulgated as to whether they require payment of a tax before the taxpayer receives any cash with which that tax can be paid.

We have made this point repeatedly over the years to the Treasury and to the Joint Tax Staff, but they have not tested legislation as to whether there will be any cash with which the tax can be paid. And this is so damaging to small companies, because when such a transaction is defined as a taxable event, the individual is then forced to go to the bank and borrow money because the transaction has not generated any cash to pay the tax.

My third point is to continue the program to encourage pension trustees to invest a small portion of the funds under their management in these venture capital funds. A good deal has been said about that; I won't take more time on it.

My fourth point would be to enact your bill, S. 2610, or an equivalent, delaying the issue of Treasury regulations regarding section 385 of the Internal Revenue Code. As proposed, these regulations are extremely harmful to small businesses, and especially to firms that are in trouble and are trying to get money quickly from venture capitalists or others to save themselves.

If you would like to add a further tax program which is not in my testimony, I too would support the rollover provision for capital gains taxes on profits that have been made in small companies, if such profits are reinvested within a 2-year period in qualifying-type companies.

Senator CHAFEE. Capital gains?

Mr. MORGENTHAUER. Yes, sir, the capital gains tax. Defer these, so long as the funds are reinvested in such companies.

I think there is no objection on the part of venture capitalists to paying a tax when the money is withdrawn from investment in these kinds of companies, but so long as it is reinvested the rollover provision would be a major enhancement to keeping money in this kind of business.

Senator CHAFEE. That would be a company as defined by the SBA rules?

Mr. MORGENTHAUER. Yes. Reasonable rules could be worked out. Obviously it is a deferring of the tax rather than an elimination of it; but so long as the money is deployed to this program, taxes should be deferred, and this would obviously both encourage reinvestment in the program and make an additional 25 percent available to be put into small companies. That is, since the tax is 20 percent of the gain, there would be a 25-percent increase in the amount available to invest in the next company.

I would strongly urge that we think in terms of incentives for successful firms and investments, do not think in terms of protection against losses, do not think in terms of Government sharing of risk.

I don't believe, from long experience with this, that the venture capitalist should expect to be shielded from his own mistakes or his own bad luck.

Senator CHAFEE. Are we doing that?

Mr. MORGENTHAUER. No, we are not. And people raise the suggestion from time to time, but I would strongly urge that there be no—

Senator CHAFEE. What suggestion?

Mr. MORGENTHAUER. We have seen in earlier years a suggestion that there be some Government funding for this kind of activity.

Beyond making money available to the SBA for the Small Business Investment Company program, I would not recommend any of it. I don't think we need to be shielded or protected.

Finally, I urge, don't think in terms of more regulation. I have heard some conversation as to whether there should be regulation or further regulation about venture capital companies. I think there are plenty of laws and regulations to take care of any potential abuses at this point.

There will be company failures. Expect these. Let's just bluntly face that up front. Because from time to time a hue and cry will go up that there are company failures, and something should be done.

For example, I think probably there have been more biotechnology companies founded than can continue to be funded over the next several years, and there certainly will be some consolidations, there certainly will be some bankruptcies. This is the history of most rapidly growing industries. It is just part of the price of a free and dynamic economy. As any venture capitalist will learn painfully from his own portfolio problems, unfortunately not every company that we fund deserves to survive.

Further in regard to regulations, so far as investors in venture capital funds, I would suggest that they continue to be required to meet sophisticated investor tests, and then let these sophisticated investors take care of themselves. There are perfectly adequate laws to deal with fraud, and other than these there is no reason to spend taxpayer money to try to protect institutions and sophisticated individuals who can afford to investigate and probably can do a better job in protecting themselves than anyone who could possibly be hired by the Government to protect them.

We do find at times State laws create some very unreasonable situations of this kind. For example, when I was president of the National Venture Capital Association and one of the major venture capitalists in the country, I could invest as an institution in certain out-of-State things, but I could not as an individual. My State laws would have prevented me from investing in something that our State agencies felt an unconscionably high price. The State agency was to tell me whether or not I was paying too much for my investment.

Senator CHAFFEE. Now, what State is that? Ohio?

Mr. MORGENTHAU. Ohio.

A number of States have fairness tests. The Federal Government, of course, has merely disclosure tests. The Federal standards are far better. Fairness tests are very unreasonable, and they have only succeeded in keeping Ohio investors out of many attractive investments.

Senator CHAFFEE. I have never heard of fairness tests. How does it work?

Mr. MORGENTHAU. If you are to sell investments from out of State into a State, they must be registered with the particular State securities authorities, or the transaction must be subject to an exemption. If securities are being sold to an institution in Ohio they are exempt; I'm an institution as a venture capital firm, and so as an institution I am exempt. But if securities are being sold to me as an individual, they must be registered with the Ohio Securities Commission, and there they must meet fairness tests. This is

somebody's judgment as to whether they are priced unconscionably high.

One of the tests that is used is whether or not there is an unreasonable multiple of earnings. Well, many of these companies have no earnings or very small but rapidly growing earnings, and so forth.

It is possible to get exemptions and to work this out, but I——
 Senator CHAFEE. If you have a limited number of stockholders, you are only selling a limited issue. Do you have to register in that case?

Mr. MORGENTHAUER. Well, you can sell anything if you can persuade the State's Securities Commission to register it.

But it is additional legal expense. I mean, if you are selling in a number of States, the young company is burdened with a great deal of legal costs and time delay, and what really happens is that in most cases they simply won't bother to sell in most States.

But I don't mean to take an undue amount of the time of this panel with this particular issue; I am simply saying that it's one of the bad examples that can occur when there is an unreasonable attempt to protect people.

I think the Federal Government in these respects, with its disclosure laws, does a good job.

Senator CHAFEE. Let's go to point 7.

Mr. MORGENTHAUER. All right, sir.

I would like to make the search for policies to stimulate research and development a much higher national priority than we are doing at this point.

I don't have specific suggestions for you today, but I would like to make the point very strongly, and I hope it will be made throughout our Government, that for 20 years we have concentrated tremendous effort and resources on our social problems. Now we are finally at the point where we simply have got to face the fact that our living standards depend on two-way foreign trade.

We were able to count on our basic industries in the past to earn a great deal importwise for us, but foreign competition has cut into this. Now that we are importing so much higher priced oil today, so many strategic minerals, importing our consumer electronics from Japan, and so many other goods and services of foreign origin, it just seems that many of the people who are pressing for our social legislation today have simply failed to recognize that we simply have got to trade goods or services back for these things that we are importing.

The world, as you know very well, is very willing to pay for our high technology products, so long as they are superior. They are very willing to pay for our services; they are obviously willing to pay for our grain.

The same world, unfortunately, has absolutely no desire to help us rebuild our cities, to take care of our aged, to take care of our sick, to take care of our nonproductive people, and the only way we are going to get them to contribute to the huge amounts of money that we are spending in these areas and spending through our social security programs and others, is simply through profits on our exports of goods and services.

We are constantly eroding our ability to compete in the export area by taxing our people who work overseas, by the pressures that we are putting on DISC corporations, and by failing to generate new high technology companies which create exports. The end effect of all of this is that our living standards are actually going to end up falling, certainly relative to the rest of the world, if we don't sort our priorities out.

Thank you very much.

[The prepared statement of David J. Morgenthauer follows:]

STATEMENT
OF
DAVID T. MORGENTHALER
SENIOR PARTNER
MORGENTHALER ASSOCIATES
ON BEHALF OF THE
NATIONAL VENTURE CAPITAL ASSOCIATION
SUBMITTED TO THE
SUBCOMMITTEE ON SAVINGS, PENSIONS AND INVESTMENT POLICY
OF THE
SENATE COMMITTEE ON FINANCE
JANUARY 19, 1983

Mr. Chairman and Members of the Committee:

My name is David T. Morgenthauer, and I am Senior Partner of Morgenthauer Associates and a director of various companies, principally high technology types. I am a Past President and Chairman of the National Venture Capital Association.

When I was asked to participate in this panel, it was suggested that I try to provide some perspective into the problems of new and growing enterprises and how Government activity helps or hinders their formation and expansion. My experience on which these comments are based began with joining an entrepreneurial team in founding a manufacturing company at the end of World War II. There were no venture capitalists, and many bankers and others expected a major depression and were very reluctant to lend or invest. We achieved a moderate success, but I can guarantee it is a different world without venture capitalists and SBIC's, as many countries of the world are still learning.

I went on to the building up of another small company, and again we grew with internally-generated funds and Government-furnished equipment. This company became a major success, but there were still so few venture capital firms in existence that it was actually several years before we talked to one.

In 1957, I became President of another small company, financed this time by venture capitalists to bring foreign technology into the U.S. The advice and support of these professionals were of great help, but it was still a world where large start-up losses could not be tolerated. Research and Development and the building of an organization had to be funded principally from internally generated sources, and very rapid build-up of a large organization was a much more difficult financial problem than it is today.

From these activities, based on stock options and stock ownership, I made enough money to form and finance my own venture capital fund in 1968. A major factor in attracting me to move to the new small company after earlier successes was the qualified stock option as it existed in the 1950's and 1960's. I doubt very much whether I would have undertaken my major opportunity if the option modifications of the 1970's had been in existence.

As has been well documented, entrepreneurship and the venture capital industry were greatly damaged in the early 1970's by the cumulative effect of increases in the capital gains tax rates, modifications of the stock option program, and certain regulations regarding public markets and pension funds.

As a co-founder of the Incentives Program of the NVCA in the mid-1970's, I can testify to the depressed state of entrepreneurship and venture capital at that time.

Much of the damage has been undone by reforms since 1978, and we have seen a great surge of activity in entrepreneurship and movement of funds into the venture capital industry. Benefits are flowing to the

country in general, and the Treasury in particular, on a scale greater than anyone foresaw when NVCA, NASBIC, AEA and others worked so hard in the mid-1970's to bring these reforms about.

I believe that entrepreneurship and venture capital are one of the brightest spots in our gloomy economy today--a major change from the poor situation that existed in the early and mid-1970's. While some are saying that there is too much money in the business and too many venture capitalists, I don't believe it. So many companies have been formed in the past several years that will require large follow-on amounts of capital that a great share of the venture money that has been raised is, in effect, already committed, and venture capitalists who thought they had obtained enough capital for years now expect to seek new money within the next few months.

It is true that we venture capitalists are having to pay more for our investments, especially in later rounds of financing, but it costs more to build up a company now than it used to, and these higher valuations have benefits for the entrepreneurs and the country, if not for venture capitalists--at least in the short run. In the long term, I think enough new entrepreneurs will be stimulated to create more opportunities for venture capitalists.

I believe the following are highly desirable actions to stimulate the emergence of new high growth industries:

1. Make sure that what has been accomplished since 1978 is not eroded. An example is the damage done by the 1982 Tax Bill to the new ISO program.
2. Eliminate the cap on Incentive Stock Options, and especially, remove ISO's as a preference tax item--to correct an action in the 1982 Tax Bill which undid much of the intent of Congress in

creating the ISO program. Test all regulations as to whether they require payment of a tax before the taxpayer has received any cash with which his taxes can be paid.

3. Continue the program to encourage pension trustees to invest a small portion of the funds under their management in venture capital funds.
4. Enact Senator Chafee's Bill S.2610 of June 8, 1982, or an equivalent, delaying the issue of Treasury Regulations regarding Section 385 of the Internal Revenue Code. As proposed, these Regulations will be extremely harmful to small business, especially to firms in trouble.
5. Think in terms of incentives for successful firms and investments, not protection against losses, or Government sharing of risk. The venture capitalist should not expect to be shielded from his own mistakes or bad luck.
6. Do not think of more regulation. I believe there are enough laws and regulations to take care of any potential abuses. There will be company failures--expect them. For example, probably more biotechnology companies have been founded than can continue to be funded, and there will be consolidations and perhaps bankruptcies. This is the history of most rapidly growing industries, and it is part of the price of a free and dynamic economy. As a venture capitalist learns painfully from his own portfolio problems, not every company deserves to survive.

In regard to investors in venture capital funds, continue to require that they meet sophisticated investor tests, and then let

them take care of themselves. There are adequate laws to deal with fraud, and otherwise there is no reason to spend taxpayer money to try to protect institutions and sophisticated individuals who can afford to investigate and probably can protect themselves better than anyone who could be hired by Government to make sure they were not victimized. State laws create some very unreasonable situations of this kind.

7. Make the search for policies to stimulate Research and Development a much higher priority. For more than twenty years, we have rightly concentrated tremendous effort and resources on our social problems--with much though not enough progress. Now the time has come to face the fact that our living standards depend on two-way foreign trade. We cannot indefinitely import oil, strategic minerals, consumer electronics and countless other goods and services of foreign origin unless ultimately we trade goods or services for them. The world is willing to pay for our high technology products and services as well as our grain. It unfortunately has no desire to pay for the care of our aged, our sick, our non-productive people, nor to pay for rebuilding our cities. Of these, other countries feel they have their own full share of such problems. We can get them to contribute to our social causes only through the profits we make through our exports. If these become less competitive, living standards must inevitably fall.

Thank you for the opportunity to present these recommendations today.

Senator CHAFEE. Thank you.
We will now hear from Mr. Collins.

**STATEMENT OF MORTON COLLINS, GENERAL PARTNER, DSV
PARTNERS III, PRINCETON, N.J.**

Mr. COLLINS. Mr. Chairman.

My name is Morton Collins, and I am a general partner of DSV Partners III, which is a limited partnership formed 2 years ago for the purpose of venture capital investing.

Prior to the formation of DSV Partners III, I was the general partner of DSV Associates formed in 1974 and chief executive officer of Data Science Ventures, Inc., formed in 1968. Both of these organizations confined their activities exclusively to venture capital financing.

Since 1975, I have been a director of the National Venture Capital Association, and from 1976 through 1979 I was chairman of the SEC Committee of the NVCA. I became executive vice president in 1980 and was elected president in April 1981 and chairman in April 1982.

Like Mr. Morgenthau, I too have been an entrepreneur, in that, prior to initiating my career in venture capital, I was the founder and chief executive officer of a computer services company, and before that I was a faculty member in the School of Engineering at Princeton University.

Today I speak on behalf of my own organization, DSV Partners, which when combined with its predecessors has made a total of 61 investments in young high technology companies—for lack of a better word, “high technology” companies—since 1968.

Our sole objective has been to provide equity funding and sophisticated management and technical assistance primarily to these new high-risk, growth-oriented companies.

I am appearing here today to assist you in looking at these kinds of high-growth technology-based industries and in understanding their importance to the economy of this country and to comment constructively on some factors which, in my opinion, affect these kinds of organizations.

We have heard earlier this morning about the U.S. leadership in technology coming under substantial assault. We certainly see that all around us in my business.

I think it is key to realize that the bulk of the translation that goes on—let me call it the translation of high technology to economic benefit—principally occurs in new small companies that depend on the availability of investment capital and, in addition to that capital, a pool of technically trained manpower.

Our economy is currently in a state of transition from that based on industrial production to that based on information services. It is not surprising to me, given that fact that the major industrial companies of the country have shown little growth in employment or other beneficial economic parameters over the last decade. The various surveys that have been done show very clearly that most of the beneficial economic parameters are flowing from small companies. They create jobs, they expend substantial sums in research and development, they have stimulated exports important in the

balance of trade, and they have increased competition and economic diversity, certainly, in our economy.

In fact, the detailed survey analysis, curiously enough, presented by Congressman Zschau before he joined your side of the table, back in 1978 at the Ways and Means Committee, showed that for every dollar invested in small company equity, within 5 years each dollar produces 70 cents in exports, 33 cents in research and development expenditures, 30 cents in taxes paid to the Federal Government by a combination of the employees of the companies and the companies themselves, and 5 cents in taxes to State and local governments. That's \$1.38 in benefits to the society for every dollar invested.

Additionally, I would call the committee's attention to a report recently issued by the General Accounting Office, which I have here before me, entitled "Government-Industry Cooperation Can Enhance the Venture Capital Process."

Mr. Pratt a few moments ago presented the summary results of that report, in that his organization was the contractor to the General Accounting Office, and therefore I will not go back over those results, except to say that once again it has shown the disproportionate effect and the productivity-enhancing effect of investments in small companies, as shown by this kind of data.

There has been, as we have already heard here this morning, an enormous increase in capital availability. Mr. Pratt's written testimony points out specifically that increase in availability as a consequence of the reduction in the capital gains taxes in 1978, of relaxed pension trust fund investment rules in 1979, and a further reduction of maximum capital gains tax rates for individuals from 28 to 20 percent in 1981.

It is my opinion that if this dramatically increased capital investment provides anywhere near the economic benefit which has been cited in these various reports and surveys, then we can anticipate a very buoyant economy and a labor shortage in this country in the 1990 to 1995 time frame, perhaps even sooner than that based on the magnitude of these investments.

There exists a very large number of tax and regulatory policy changes that would serve to continue and enhance the flow of capital to new innovative companies of the sort that we are talking about.

There was recently, in September, a 3-day forum sponsored by the Securities and Exchange Commission entitled "SEC Government-Business Forum on Small Business Capital Formation." I appended to these comments the 32 specific recommendations which have been abstracted from the report of that forum. You might call this a "wish list of changes." You are looking for specifics? This is a wish list of specifics from small-business-at-large as developed in this forum, which was attended by a very large number of small business representatives. In my opinion, implementation of these recommendations would provide a substantial stimulus to the developing high-technology sector of the economy.

If I allow myself to think, however, beyond these specific recommendations which are principally in the tax and regulatory area, I would make the point that we must be careful to examine the rules of the game by which our companies are forced to play. We are,

after all, competing in world markets in technology, and artificial trade barriers are not a useful answer to the question of that competition. If we are subjected to the same rules as our foreign competitors, I am of the opinion, at least, that we will prevail and retain our competitive advantage.

Senator CHAFEE. Can you give me an example of a rule we might be subjected to? Do you mean the Foreign Corrupt Practices Act?

Mr. COLLINS. I don't think the Foreign Corrupt Practices Act, particularly, I think more in terms of let's say our depreciation policies, for instance, our depreciation laws. Although they have been improved and enhanced and helpful, technology is moving ahead at a very rapid pace these days, and we in the semiconductor business, for instance, often install a machine that costs \$2 or \$3 million, a piece of production equipment that 2 years from now we put out on the curb for the trash man to take away.

Now, if our policies require that we depreciate this piece of equipment over a 7-year time period, and the Japanese allow their companies to depreciate or expense the same piece of equipment, we may in fact be spotting the Japanese 25 cents a chip on the particular devices produced by that piece of equipment.

I am simply saying that there are probably a lot of those kinds of things that haven't been looked at very closely which cause our industries to play the game according to different rules than the industries of other world economies.

Senator CHAFEE. I am not trying to put you on the spot, but the depreciation is a good illustration.

Mr. COLLINS. Yes.

Senator CHAFEE. Do you have another one that you want to address? The more specifics we have, the more it helps me.

Mr. COLLINS. Well, I don't have another one I could use as an example. We have talked about the market access, but that's a slightly different thing.

Senator CHAFEE. I was thinking of hindrances. For instance, Mr. Price testified earlier about Americans working abroad. We did change that. We removed the taxation on Americans working abroad.

Yes, I think we should remove these disincentives, as much as we can within reason. Some of them we can't. I'm not sure we'll be able to do much in the depreciation schedules for a while, anyway.

Mr. COLLINS. Well, the point is, if we don't look carefully at the rules by which our companies are forced to play the game, and if those rules are substantially more restrictive—let me put it differently. If those rules are substantially more costly to our companies than to their competitors in the world markets, then we are giving away those industries.

I mean, for instance, the consumer electronics industry is gone, which was once the province of this country. I don't know if it came about for that reason or not; it's one of many reasons. And that's a specific example which I see close up in the companies in which I have made investments over the years.

Senator CHAFEE. Mr. Morgenthau mentioned that early career borrowing from banks was difficult.

Now, the banks haven't become any easier, but there is a whole new source of capital available through the venture capitalists. As

somebody pointed out, you don't want to go into debt in these things, you want to have equity.

Mr. COLLINS. That's correct.

Senator CHAFEE. I don't think therefore, that we should look to banks for more activity in these venture capital areas. Does everybody agree with that?

Mr. COLLINS. Absolutely.

Senator CHAFEE. The Japanese, as was pointed out earlier, have this tremendous rate of savings. They must be getting their money from debt, are they not?

Mr. COLLINS. Well, the Japanese do substantially larger debt structures than we do. The first time I looked at the balance sheet of a Japanese company I knew it was bankrupt and would be out of business by the next week. But I suddenly discovered that that's the way it is in all Japanese companies, but their relationships within their trade associations, trade groups, includes the bank. And things are looked at on a somewhat different scale.

But I think you can take that all apart and find out that it isn't terribly different. If you back up far enough from it, you can see that while our levels are more specific and less interrelated, the same things happen.

If you are just talking about pure economics, unless their society is willing to tolerate a lower return on investments—that's where it all starts. Perhaps their inflation rate has been less aggressive than our own, and that's one of the things that is a primary determinant of savings, in my opinion, at least, and investments.

And, while I don't have the kind of training and experience of the major economists that we have already heard from here today as well as elsewhere, I have looked very hard at the data over the 15 years that I have been a practicing venture capitalist, and I guess what I have concluded from that, Mr. Chairman, is that investment is good and consumption is bad, and anything that you can do to improve the climate for investment and capital formation will pay substantial dividends for this society and this economy.

The data certainly addressed that question in a very determinant way; but I see it time and time again, and I find difficulty in finding other ways of expressing it other than to look at the problems that exist in the economy and how investment affects those problems.

And for the Government to put barriers in front of investments seems to me foolish, that's all.

The last problem that I wanted to address was the human capital problem, and the appalling state of science and mathematics training in primary and secondary education has all been addressed by someone. I think something needs to be done about that.

Furthermore, I think we have to consider programs, and I have no specific suggestions in this area, to retrain workers that are displaced by the rapid evolution of technology.

We are going to find ourselves in a situation by 1990, in my opinion, where we are going to have a continuing problem of unemployment in a labor-short economy, and we are going to have to do something about that.

[The prepared statement of Mr. Collins follows:]

STATEMENT OF
MORTON COLLINS
GENERAL PARTNER, DSV PARTNERS III
CHAIRMAN OF THE NATIONAL VENTURE CAPITAL ASSOCIATION
BEFORE THE
UNITED STATES SENATE
COMMITTEE ON FINANCE
Subcommittee on Savings, Pensions, and Investment Policy
January 19, 1983

Mr. Chairman and Members of this Distinguished Committee:

My name is Morton Collins and I am a General Partner of DSV Partners III, which is a \$35 million Limited Partnership recently formed for the purpose of venture capital investing. Prior to the formation of DSV Partners III, I was a General Partner of DSV Associates, formed in 1974 and Chief Executive Officer of Data Science Ventures, Incorporated, a privately held corporation formed in 1968. Both of these organizations confined their activities exclusively to venture capital financing. Since 1975, I have been a Director of the National Venture Capital Association, a trade association representing most of the organized venture capital firms in the country. From 1976 through 1979, I was Chairman of the SEC Committee of the NVCA and I became Executive Vice President of the organization in 1980. I was elected President of the NVCA in April, 1981 and Chairman in April 1982.

Prior to initiating my career in venture capital, I was the founder and Chief Executive Officer of a computer services company and before that I was a faculty member in the School of Engineering at Princeton University.

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I am pleased to have been invited to testify here today and I thank the Committee for this opportunity to further explore solutions to the economic problems of the country. Today, I speak on behalf of my own organization, DSV Partners III, which when combined with its predecessors has made a total of 61 investments in young high technology companies since 1968. Our sole objective is to provide equity funding and sophisticated management and technical assistance primarily to new, high risk, growth oriented companies.

I am appearing here today to assist you in reaching an understanding of the vital importance of high-growth, technology based industries to the United States Economy and to comment constructively on those factors which in my opinion affect such organizations. The United States is the undisputed world leader in innovative technology - one of perhaps only two areas in which this country possesses a distinctive competitive advantage over other economies, the other being agriculture. This leadership position is currently under substantial assault.

It must be realized at the outset that the bulk of the translation of high-technology to economic benefit occurs in new small companies that depend on the availability of investment capital and a pool of technically trained manpower. The economy of the United States is currently in a state of transition from being based on industrial production to being based on information services. It is not surprising that all the surveys indicate that the major industrial companies of this country have shown little growth in employment or other beneficial economic parameters over the last decade. The surveys show very clearly that new innovative high technology companies have:

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- Created jobs - It is estimated that 85% of all net new jobs are created by small companies;
- Expended substantial sums on research and development vital to innovation and productivity;
- Stimulated exports important for balance of trade and stability of the currency, and;
- Increased competition and economic diversity assuring a dynamic economy which is desired by the Congress and by the people.

Detailed survey analysis presented to the Ways and Means Committee in 1978 indicated that within five years, each \$1.00 invested in small company equity produces each year:

- \$0.70 in exports;
- \$0.33 in R&D expenditures;
- \$0.30 in taxes paid to the Federal Government;
- \$0.05 in taxes paid to State and Local Governments.

This adds up to a total of \$1.38 in benefits for all, for each equity dollar invested, each and every year. On a present value basis, \$0.30 a year forever is worth \$3.00 (at a 10% discount rate). Thus, when government decides to tax a potential equity dollar at \$0.20, it is deciding to accept something worth \$2.40 now instead of something worth \$3.00 now. This does not take into account the additional benefits in the area of exports, R&D spending, job creation and State and Local taxes.

For additional data, I call the attention of the committee to a recent report published by the General Accounting Office entitled "Government-Industry Cooperation can Enhance the Venture Capital Process." This report demonstrates the effect of

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capital investment on the nation's economy and the enhancement of productivity growth achieved during the 1970's. This report details the experiences of 1,332 companies started with venture backing during the 1970's and demonstrates benefits to the nation's economy and productivity that are disproportionately large compared with the amount of capital invested. For example, with \$209 million invested to create 72 of these firms, their combined sales in 1979 alone totalled \$6 billion. Growth in annual sales averaged 33 percent a year and, in the process, these firms created:

- An estimated 130,000 jobs;
- Over \$100 million in corporate tax revenues;
- \$350 million in employee tax revenues, and;
- \$900 million in export sales.

Moreover, most products were productivity enhancing, such as computer related equipment, fiber optics, industrial controls, lasers, robots and word processors. Productivity gains resulted from the diffusion of such products into the design and manufacturing operations of a wide variety of industries.

There has been an enormous increase in capital availability for new small businesses as a consequence of:

- The reduction of capital gains taxes from 49 percent to 28 percent in 1978;
- Relaxed pension trust fund investment rules in 1979 and;
- Further reduction of maximum capital gains tax rates for individuals from 28 percent to 20 percent in 1981.

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If the dramatically increased capital investment which has occurred since 1978 provides even a small fraction of the economic benefits cited in the referenced surveys, the United States can anticipate a very buoyant economy and a labor shortage in the 1990-1995 time frame.

There exists a large number of tax and regulatory policy changes that would serve to continue and enhance the flow of capital to new innovative technology companies. I was a participant in a three day Forum this past September sponsored by the Securities and Exchange Commission entitled "SEC Government-Business Forum on Small Business Capital Formation." I have appended to my written comments a list of the 32 specific recommendations produced by this Forum. Implementation of these recommendations would provide substantial stimulus to the developing high technology sector of the economy.

Thinking beyond those recommendations, it must be realized that United States technology competes in a world market. It is, therefore, imperative that the "rules of the game" be carefully examined to insure that U.S. companies are not placed in competitive disadvantage by U.S. laws. This is particularly applicable in the semiconductor industry which is the heart of the "new" technology and is an area in which the U.S. leadership is under significant attack. Artificial trade barriers are not a useful answer to this question. If U.S. companies are subjected to the same "rules" as our foreign competition we will prevail and retain our competitive advantage.

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Additionally, the problem of human capital needs to be addressed. The current state of science and mathematics training at the primary and secondary school levels has deteriorated dramatically over the past two decades. Programs to retrain workers displaced by the rapid evolution of technology must be created. The human problem will loom ever larger as the economy accelerates its transition to an information services base. If this problem is not addressed the U.S. will face a continuing problem of unemployment in a labor short economy.

In conclusion, I urge you to take those actions which will:

- Enhance the flow of investment capital to new technology companies;
- Insure that U.S. companies are not placed at a competitive disadvantage in world markets by U.S. laws that are more restrictive than those of foreign competitors;
- That training in mathematics and science be enhanced dramatically, particularly at the primary and secondary levels of education, and;
- That programs to retrain workers displaced by technological change be created.

I thank you for your attention and welcome your questions.

APPENDIXRecommendations from the First SEC Government-Business
Forum on Small Business Capital Formation*

1. Amend the Internal Revenue Code to permit the issuance of a "Small Business Participating Security."
2. Create a "Capital Bank" to fund the SBIC program.
3. Remove the \$35 million ceiling on SBIC leverage.
4. Amend Subchapter M of the Internal Revenue Code to provide conduit tax treatment for Business Development Companies.
5. The Department of Labor (DOL) should disseminate its position that pension fund investments in smaller companies are not per se imprudent.
6. DOL should promulgate a "plan assets" definition to permit additional pension fund investments in venture capital pools without having the venture capital managers qualify as plan fiduciaries and without the venture capital pool assets qualifying as "plan assets."
7. States should legislatively create a flexible prudent man standard for public pension funds whereby the whole portfolio is judged as opposed to each specific investment.
8. Pension funds and other institutions should be encouraged to use intermediaries experienced in small business financing in an effort to facilitate investment in small business.
9. The SEC should exercise its jurisdiction:
 - A. under §3(b) of the Securities Act, to determine that no federal interest exists in offerings of less than \$5 million by "Small Business Concerns" not required to be registered under §12 of the Securities Exchange Act at the time of the offering. "Small Business Concerns" should be defined to exclude: (i) divisions or subsidiaries of non-exempt companies, and (ii) tax shelter type offerings.
 - B. to encourage a change in §12(g), by law or regulation, to increase materially the threshold criteria for registration, using net worth (shareholders' equity) as the test [suggested \$5 million net worth and 2,000 shareholders].
10. An issuer whose securities are neither listed on an exchange nor traded on NASDAQ should be permitted to satisfy the Exchange Act reporting and proxy requirements if the issuer makes available to its shareholders and files with the SEC the following information:

10. A. within 90 days after the end of its fiscal year, financial statements audited in accordance with GAAP for the last two fiscal years; and
B. 45 days after the end of each of its first three fiscal quarters, an unaudited financial statement in the same form as required for a 10-Q report.
11. Form S-18 registrations should be permitted for offerings of up to \$10 million.
12. The Financial Accounting Standards Board (FASB) should identify the financial information needed by small business lenders and investors to make investment and credit decisions.
13. The SEC should introduce the concept of "substantial good faith compliance in all material respects" into the exemptive scheme by providing that substantial good faith compliance in all material respects will satisfy SEC exemptive requirements.
14. Amend Rule 144 to all non-affiliates to sell their securities after three years without any further regulatory requirement.
15. State security regulators should develop and adopt:
 - A. a uniform exemption at some level similar to Rule 504 of Regulation D; and
 - B. uniform limited offering exemptions identical to Rules 505 and 506 of Regulation D.
16. Raise the top dollar level to \$500,000 in taxable income before the maximum corporate tax rate becomes effective and increase the dollar size of the brackets falling within that maximum amount.
17. Congress should consider:
 - A. allowing income averaging for small businesses;
 - B. increasing the accumulated earnings tax exemption;
 - C. making dividends deductible; and
 - D. requiring the development of a small business data base.
18. Provide a 10% investment tax credit for an investment made in a "Qualified Small Business Investment."

19. Allow a seller to exclude 80% of any gain realized on an investment made directly in a small business and held for more than five years.
20. Corporations should be made eligible for §1244 ordinary loss treatment and the ceiling for §1244 deductions should be increased for both individuals and corporations from \$1 million to \$5 million.
21. Allow an unlimited deduction of interest paid on loans for small business investments.
22. If an investor has attained age 65 and has held his investment in a small business for 10 consecutive years preceding the sale, allow a onetime exclusion of a percentage/dollar amount of any realized long-term capital gain.
23. Repeal §385 of the Internal Revenue Code, or if Congress declines, provide for five broadly defined safe harbors.
24. Congress should further liberalize Subchapter S, by:
 - A. allowing more than one class of stock;
 - B. permitting partnerships and trusts to be Subchapter S shareholders;
 - C. increasing the number of Subchapter S shareholders to as many as 100;
 - D. allowing Subchapter S corporations to form DISCs; and
 - E. allowing up to 240 days in a year to make a Subchapter S election.
25. Restore the general jobs tax credit as originally enacted in the Tax Reduction and Simplification Act of 1977.
26. Allow businesses with less than \$3 million in annual sales to elect the cash receipts and disbursements or accrual method of accounting.

27. Amend the incentive stock option (ISO) provisions by:
 - A. increasing the §422A(b)(8) ceiling limitation of \$100,000 to permit equity opportunity to attract key employees;
 - B. eliminating the sequential exercise rule prescribed in §422A(b)(7); and
27. C. eliminating ISO's as a tax preference under the alternative minimum tax provisions.
28. Allow SBA to permit revolving credit arrangements and other normal commercial loan accommodations in connection with SBA loan guarantees.
29. Raise SBA's loan guarantee limit to \$1,000,000.
30. Increase SBA's aggregate loan guarantee authority and increase the SBIC and 503 program authorizations.
31. Preserve the current tax-exempt status of small business industrial revenue bonds (IRBs) and eliminate the sunseting of IRS tax benefits.
32. Consider the needs of the small and medium-sized banks that finance small business when enacting legislation affecting financial institutions.

Senator CHAFEE. Thank you very much.
Now Mr. Bell. We welcome you here.

**STATEMENT OF J. MICHAEL BELL, PRESIDENT, HIXON VENTURE
CO., SAN ANTONIO, TEX.**

Mr. BELL. Thank you.

Let me apologize for being late this morning, but I think it has worked out just as well.

I will try to summarize. I will state just in the beginning that my name is Michael Bell. I am from San Antonio, Tex., which I understand is one reason for not being here today. I understand this is—what do they call it? Redskin Week, or Cowboy Week? [Laughter.]

Senator CHAFEE. Yes.

Mr. BELL. There is some sort of an ambush planned on Saturday, but I hope to be gone by then.

I am president of a firm in San Antonio called Hixon Venture Co. It's a corporate venture capital investment entity. We also have a partnership that we manage called Southwest Venture Partners. It has a number of other partners in it, from the university endowments to other wealthy families, from corporate money, and so forth.

We have been active investors in the venture capital process for many years, as have your other panelists here today, and we have some of the same observations. However, I would like to emphasize a few different things than have been stated, perhaps, already.

One is that I am not so sure that we really wish to have Government do a great deal more for us. I don't think there is a great deal in the way of programs that the Government needs to initiate.

Our primary interest is in seeing the Government help to create and maintain an atmosphere of stability and consistency within the economic framework of the country.

Too often over the last 15 or 20 years we have seen policy reversals and directions one year—

Senator CHAFEE. Yes, Mr. Morgenthau pointed that out—what we did in the 1981 tax and what we did in the 1982 tax.

Mr. BELL. Yes, sir. Exactly. Those are good examples.

Senator CHAFEE. Wait for 1983. [Laughter.]

Mr. BELL. So now we are in 1983, and we are trying to find a new initiative. And I guess our interest is in seeing the stability that enables young business to predict what is going to occur ahead in the next few years and therefore plan for growth, plan for investment, and be able to attract the kind of investment support that is out there looking for these opportunities today.

The reason the capital is there today is because of what Congress did in 1978 and what it did again in 1981, and the things that have been done in the last few years to help expedite the investment process. Some of those continue, at the very least we hope they can be maintained.

We would like to avoid the inadvertent accident that can befall the venture community, as it has occasionally, for example, in the debt-equity regulations that are proposed that you have been helpful on, where Treasury is impacting the entire business community, but particularly small business, and particularly the venture

capital process. That is going to be a difficult process and a very expensive one.

Another example is the Department of Labor hearings on the plan-asset regulations under ERISA, which had the inadvertent effect of stopping all investment by pension funds in venture capital enterprises or firms for about a year, I guess, during the time in which we were trying to determine what the problems were at DOL and what the impact of the ERISA regulations would be on venture capital investment.

Throughout Government there are a number of other items that could be addressed. I mean, the Patent Office problem—we have a large backlog there of continuous heavy loads of patent processes that need to be addressed.

The SBA has been one of the most successful programs of Government partnership with business and the investment community ever instituted; and yet the last 2 or 3 years, the SBA has almost starved for lack of funding and lack of support and lack of aggressive promotion of its activities. This is another group of investors, somewhat separate from some of us, but who address a very broad spectrum.

Senator CHAFEE. You are talking about the Small Business Administration.

Mr. BELL. Yes, sir.

The SBIC program, over the 24 years of its existence, has put out roughly \$4.5 billion of investment funds—\$1.7 billion of that was Federal funds, and another \$2.8 billion was private funds. The private funds are from individuals like ourselves and firms like ours who make investment commitments initially and then later on borrow money from the SBA to continue to support small business investment.

That has been a terribly successful program. I don't know of many abuses. I speak from a standpoint of some objectivity. We don't have an SBIC, don't employ one, and don't intend to; but we do recognize it as a laudable program, and it's a terribly good example of what the Government has done and can continue to do.

Other than that—and I have an outline in my paper which addresses most of these points, and I think the text of the presentation speaks to them in some detail—I don't think there is a lot we expect Government to have to do other than to continue to help us as they have in the last few years and maintain the gains we realized recently.

Thank you.

Senator CHAFEE. Thank you.

[The prepared statement of Michael Bell follows:]

TESTIMONY BY

MICHAEL BELL OF
SAN ANTONIO, TEXAS

PRESIDENT

NATIONAL VENTURE CAPITAL ASSOCIATION

BEFORE THE

SUBCOMMITTEE ON SAVINGS, PENSIONS AND
INVESTMENT POLICY

OF THE

UNITED STATES SENATE COMMITTEE ON FINANCE

THE HONORABLE JOHN H. CHAFEE, SENATOR
FROM RHODE ISLAND, CHAIRMAN

ON

PROMOTING HIGH GROWTH INDUSTRIES AND
UNITED STATES COMPETITIVENESS

WEDNESDAY, 19 JANUARY 1983, WASHINGTON, D.C.

ISSUE OUTLINE

- I. Stability Within the Economy
 - A. Inflation
 - B. Interest Rates
 - C. Stock Market
- II. Positive Government Actions
 - A. Favorable Capital Gains Tax Treatment
 - 1. Further Reductions and Parity
 - 2. Roll-Over For Venture Capital Small Business
 - 3. Scale-Down Over Lengthy Holding Periods
 - B. Incentive Stock Options
 - 1. Eliminate Its Limitation
 - 2. Remove Alternative Minimum Tax Treatment
 - C. Continued SEC Liberalization of Rules, Regulations and Statutes
 - D. Support Research and Development Tax Incentives Directly and Through Limited Partnerships
 - E. Improve Patent Office Procedure and Protection
 - F. Inflation Reduction and Ultimate Elimination
 - G. Reduction of Interest Rates
 - H. Reduce or Eliminate Budget Deficits
- III. Negative Government Actions
 - A. Large Budget Deficits
 - B. Burdensome and Conflicting Statutes and Regulations
 - 1. DOL Plan Asset Regulations
 - 2. Treasury's Proposed IRC § 385 Debt-Equity Regulations
 - C. Program and Policy Reversals
 - D. Confiscatory Taxes

Good afternoon. Thank you for inviting me here. I am Michael Bell of San Antonio, Texas, currently serving as president of the National Venture Capital Association, a professional association of approximately 140 venture capital firms representing more than \$6.5 billion in investment capital directed towards innovative enterprises in the United States. These firms are partnerships and corporations sponsored by families and individuals, financial institutions, universities and industrial corporations. The National Venture Capital Association was formed in 1972. I also am president of my own firm, Hixon Venture Company, a corporate venture capital fund of approximately \$20 million in size owned principally by the Hixon family, and a managing general partner of Southwest Venture Partners, a \$20 million limited partnership owned by two families, university endowments, insurance corporate funds and pension funds. Hixon Venture Company was formed in 1975 and Southwest Venture Partners was formed in 1981, both as extensions of the Hixon family venture capital investment activity going back over several decades previously. Both of these entities direct their investment activity, principally but not exclusively to opportunities in the Southwest, in energy, computer technology, communications and medical situations. Combining the two entities, we currently have investments in some 38 companies located throughout the United States. All of our investments are in the equity, usually represented by common stock, of small, private companies which show promise of high growth in new areas of commercial activity. Most of the investments we have made have been in the start-up stage of the enterprise's life.

Businessmen take risks. Small businessmen take relatively larger risks due to their more limited financial resources and more

vulnerable cash flows. Entrepreneurs, and the venture capitalists who back entrepreneurs, are willing to take even higher risks, particularly in those areas of activity directly pertaining to the enterprise itself, e.g., product development, manufacturing or production, raw materials, personnel, financing, marketing, service, competition, etc. These risks can be dealt with; these risks can be quantified and are understandable and generally predictable within a reasonable range. It is the macro factors, the uncontrollable and unpredictable factors in the economy at large, that are the most fearful to the manager of a prospective enterprise and his investors, e.g., inflation, interest rates, taxes, government regulation, public policy reversals or shifts, stock market performance, labor costs, energy costs, price controls, etc. These can have drastic, dramatic effects on the prospects for earnings and growth, and even survival, of the fledgling company; these are much less predictable and are frequently at cross-purposes within the government and the economy itself; these are the areas where government policy and procedure are of paramount importance. Predictability or stability and adequate incentives are what is acutely needed. That is why we are here today -- to address these issues.

The venture capital process is the process of shifting capital generated by prior successes and applying it to totally new, emerging technologies or commercial innovations. Instead of the internal allocation of corporate capital to products and services consistent with established activities of an existing company, the venture capital process frequently provides for a shift of capital outside of those established companies to fresh, new opportunity areas.

The venture capital process, until recently, has not been well understood by the public, educational institutions or government. This misunderstanding was probably most acute between the venture capital industry and the government, a gap which appears to have closed substantially in recent years. At the request of Senator Lloyd M. Bentsen, Jr., the general accounting office published in August 1982 a rather favorable account of what has transpired through the venture capital process. This report urges heightened awareness and cooperation between the venture capital industry and the government in years to come.

The GAO report notes that 1,332 companies were started with venture capital backing during the 1970's and that the results were disproportionately large when compared with the amounts of capital invested. In examining a selective 72 of these firms, \$209 million was invested, and their combined sales in 1979 alone totalled \$6 billion and growth in annual sales averaged 33% per year. In the process these firms created 130,000 jobs, \$100 million in corporate tax revenues, \$350 million in employee tax revenues and \$900 million in export sales. Furthermore, most of the new products developed by these firms were productivity enhancing. In addition, Commerce Department data indicates that over the last decade, high technology businesses grew at an average 7% per year versus 3% for all United States industry. During this 1970-1980 period, price inflation for high technology businesses was 2.5% per year versus 7% for all United States industry. In 1980, high technology businesses produced a \$30.5 billion positive trade balance versus a negative \$54.7 billion trade balance for all other businesses. During the 1970's, productivity of high technology businesses increased six times faster than

the average productivity of all United States businesses. Each job created in a high technology sector creates eight additional jobs in other sectors supplying it.

These remarkable statistics underscore the importance of technology supported by the venture capital process to the United States economy. Capital gains tax reductions, rapid depreciation allowances, investment tax credits, tax credits for research and development and limited partnership research and development incentives are now stimulating the formation of many small businesses and new venture opportunities. According to Dun & Bradstreet the number of new businesses incorporated in 1981 rose to a record of nearly 600,000 from less than half that ten years ago.

Those of us in the venture capital business through the 1960's and 1970's were well aware of the benefits that could be unleashed by good people, well-organized and managed venture capital and prospective technological developments. The need for better understanding of the process on the part of the United States Government was widely recognized within the industry, giving rise to the formation of the National Venture Capital Association in 1972. The officers of the National Venture Capital Association have testified on scores of occasions before various congressional committees on bills before Congress and issues under consideration by the Securities & Exchange Commission, Department of Labor, Department of Commerce, the Treasury and other agencies. While numerous and various specific matters were at issue, the National Venture Capital Association consistently sought a better understanding of the role of private investment capital, the elements of job creation and the requirements of capital

formation combined with the proper government support and stimulation of the over-all process.

In the early 1970's we were handicapped by a tax policy that punitively taxed productive capital, severely reducing the amount of reinvestable funds and discouraging risk-taking. There was the misguided notion that capital gains should eventually be taxed as income, and the Revenue Act of 1969 taxing capital gains at 49% was a start in that direction. This trend was finally reversed in 1978 with the Steiger Amendment reducing long-term capital gains taxes to 28%. The intensive efforts by many individuals and organizations, including the National Venture Capital Association, were instrumental in influencing Congress to act favorably on the Steiger legislation. The favorable changes in the tax laws were accompanied by a fundamental change in attitude by government toward capital as a creative agent in financing change and innovation as constructive elements of the economy.

There were further important shifts in government attitudes during this period. For example, much of the work of government agencies, in particular the SEC, has to do with protection of the public investor. The Securities Act of 1933, the Investment Company Act of 1940 and the Investment Advisors Act of 1940 are the backbone of this regulatory process. Unfortunately less attention has been paid to the creative and productive side of the capital system, to the affirmative attitudes and policies necessary for capital formation. During the 1970's capital formation continued to be poorly understood. Conventional concepts of capital formation dealt mainly with shifting of capital and transfer of capital and gave less attention to the generation of new capital. New

capital formation in the last analysis stems from new values and credits produced by new streams of growing earnings produced by new products and services. The resultant job creation as a function of this process was finally appreciated, an encouraging contrast to the notion of jobs as a direct function of pump-priming government outlays which had been inherited from the 1930's. The Small Business Incentive Act of 1980 reflects a new affirmative government attitude. In September 1982 the SEC conducted an intensive three-day forum between small business people, venture capitalists and government representatives, the first of its kind, to review continued obstacles to capital formation. Numerous recommendations were offered and taken under advisement and, hopefully, will be acted upon.

The current pool of private venture capital in the United States approximates upwards of \$10 billion. The National Venture Capital Association represents the majority of these assets. This pool had remained fairly static at \$2 billion to \$2.5 billion until 1977. With the reduction of the capital gains tax in 1978, concurrent with other favorable factors, the venture capital pool began to grow rapidly to its present level, and it is still growing. Disbursements of venture capital also have risen dramatically. The mid-1970's saw an investment rate of about \$450 million to \$600 million per year, down to as little as \$50 million in 1977. The year 1981 saw \$1.3 billion committed to venture capital enterprises. The additional impetus of the further reduction in the capital gains tax rate to 20% for individuals in 1981 in the Economic Recovery Act sponsored by President Reagan has resulted in a further increase in the rate of investment by capital sources in the venture capital industry. As

pointed out above, the actual reduction in rates during 1981 and 1978 caused venture capital investment in the development of small businesses to achieve a record historical level of \$1.3 billion in 1981, an increase of 30% over the previous year. Based on preliminary data for 1982, the amount of funds committed to the venture capital industry for investment in new small businesses should be approximately \$1.7 billion. When combining 1981 and 1982, the funds committed to venture capital are more than the previous five years combined. This will directly translate to more business investment, more jobs, more productivity increases, more new technology through new enterprises of all kinds throughout the country. The capital gains tax rate reduction is one example of a tax cut working. Since the 1981 rate reduction only applied to individuals, not to corporations, one must ask whether further steps in this direction might not be highly beneficial to the economy.

As we now know from experience, lower capital gains tax rates provide an incentive for direct investment in new, innovative businesses because the greater the differential between capital gains taxes and the tax rate on ordinary income, the more investors will be encouraged to invest in higher-risk, higher-return opportunities where growth is manifested in capital appreciation instead of dividends or interest. The capital will be directed to research and development for new products or services, new plants and equipment, and new jobs.

Look at the peak years of research and development within the United States economy and the growth of the nation's businesses during the 1950's and 1960's. It is no coincidence that in those days the top bracket tax rate applied to ordinary income was 91% (until 1965, when it

became 70%) and the maximum capital gains tax rate was 25%. This kind of differential generated an enormous incentive for capital investment, and growth was what we achieved. The country needs that incentive for growth today even more.

Some people think that only the rich benefit from lower capital gains tax rates. Looking beyond this misconception, it is easy to see that the immediate beneficiaries of lower capital gains tax rates are young, growing companies and the people who work for them. People take risks when they start, join, or invest in a new company. Venture capitalists investing in such companies are careful to make sure that the entrepreneurial group has a large stake in the equity of the company. Furthermore, people who join the company are typically attracted in large part by options to purchase stock, which if the company succeeds, may lead to significant capital gains for those people. Many young companies today have company-wide incentive stock option programs, further increasing the number of employees who can participate. Thus the venture capitalists, the entrepreneur, and their employees participate in a meaningful way in the success of a young, growing company. It is the prospect of such success and such favorable tax treatment that lures the entrepreneurs and their employees away from well-established companies to participate in the young ventures.

Nowhere is there a greater potential for capital gains than in the growth of a brand new company from start-up to mature company with growing earnings. Therefore, with favorable capital gains treatment, there is no shortage, as there was in the recent past, of capital for investments in such enterprises. As mentioned above, since the intro-

duction and passage of the 1978 and 1981 capital gains tax reductions, the funds dedicated to venture capital for development of small business have grown phenomenally.

Many people believe that venture capital investments are made only in new plants and equipment and other hard, tangible business assets. They think that these are already subject to the new, more generous depreciation rules and investment tax credits. However, this is not the case. Most venture capital invested in new companies goes to pay early stage research and development, frequently represented by salaries of employees who develop the technology that the company is to sell. Tangible business assets can frequently be financed by bank loans and are rarely purchased out of equity capital while bank loans are rarely available to get companies started.

Today the nation is making the transition from a manufacturing economy to one based on high technology and services during a time when basic foundations have been weakened by prolonged inflation. Tax policies, such as further reduction in the rates of tax on capital gains and other economic incentives, should encourage that transition and make it as painless as possible. Continued improvement in stock option tax treatment and availability should be a high priority as well. Deferment of capital gains taxes so long as investment gains are reinvested ("roll-over") in venture capital small businesses directly should be enacted, and a scale-down of capital gains taxes for each year the investment is held would be highly positive as well. Perhaps no tax should be paid on gains realized on investments made over ten years previously, for example. This would encourage truly long-term investment strategies tremendously and could

help to fund the very important frontier technology research necessary to maintain our technology advantages, both commercially and in national defense areas.

At the same time Congress must strive to eliminate impediments to investment in young companies. Recent examples of discouraging government actions can be found in the Treasury's proposed regulations under Section 385 of the Internal Revenue Code (the debt-equity rules) or the Department of Labor's Plan Asset regulation under ERISA. Both have caused lengthy, expensive periods of uncertainty for small business particularly and for the venture capital community specifically.

Fortunately your chairman, Senator Chafee, took the lead, along with several other senators, by introducing legislation designed to help the entire financial and business community avoid a dreadful and unnecessary bureaucratic land-mine by postponing the effective date of the proposed regulations by Treasury defining debt and equity under IRC Section 385 to allow time for further study and, hopefully, simplification of the lengthy, rigid and complex regulations now proposed. We are very grateful for that support; we are still counting on it because the differences between Treasury and the business, legal and accounting communities still exist.

On the DOL matter negotiations and comment are still underway after three years, and we remain hopeful of a positive resolution.

These are examples, though, of well-meaning regulations and agency efforts having far-reaching and terribly substantial impact on unintended segments of the economy. Once noticed, they still prove unbelievably difficult to reverse or clarify positively.

Finally, the United States has not yet decided how to react to the substantial role that other governments play in encouraging and assisting the competitiveness of key sectors of their economies. The difference between the United States and other market economies is not necessarily that their governments intervene in their economies and that the American government does not; it is that other governments often intervene to support, or remove impediments to the enhanced competitiveness of key sectors "targeted" for special attention, while the American government often intercedes to regulate economic behavior in ways which, often inadvertently, reduce international competitiveness while serving some other, and hopefully meritorious, regulatory objective. It is also not that other countries have "industrial policies" and the United States does not; in fact, in such areas as energy, agriculture and defense, the United States has pursued policies designed to subsidize or encourage according to government guidelines given industries. This includes research and development and financial support. Other countries have engaged in such supportive actions more broadly than the United States and used the same methods as we and additionally have acted to rationalize production amongst select enterprises and extended a greater degree of support for product commercialization.

The United States must seriously consider whether it wants the government to play a broader, more supportive and perhaps more interventionist role in high technology sectors or whether it will adhere to and try to improve upon the more traditional United States approach of changing tax and regulatory policies in ways which benefit certain broad categories of enterprises. The fact is that American high technology industries can compete internationally. Indeed, the veritable explosion of new firms, new ideas and new jobs in this area is ample demonstration of that fact. Continued United States dynamism in these areas will require regulation, tax practices and export financing practices which ensure that impediments are not imposed on the competitiveness of such firms and that the investment process supporting these firms is enhanced. We do not wish to see an interventionist role by our government. We prefer that a more supportive posture be reflected in our tax and regulatory policies.

Thank you very much for your invitation to the National Venture Capital Association to be here today.

Senator CHAFEE. Mr. Pratt, do you think there is too much venture capital around?

Mr. PRATT. No, sir. I think there are a thousand qualified entrepreneurs for every venture capitalist in this country. I think that the entrepreneurs and the opportunities are there nationally.

In my talking to venture capitalists, they virtually all tell me they have never seen a higher quality and quantity of investment opportunities than they do today. That doesn't mean that there may not be a little bit of what I call the "nifty-50 complex" that they have learned from pension funds and others, where they all chase the same investments every now and then; but in fact, I do believe that we must look at our own human resources within the venture capital industry because of its apprentice nature.

But I do not believe at all there is too much money chasing too few opportunities. It's just the opposite.

Note that they are disbursing—in my numbers in that statement you have—they have been disbursing more than they have been getting in every year that we have recorded it in the history of the venture capital business.

Mr. MORGENTHAU. Mr. Chairman, if I could add a point to that. I happen to be an adviser to another very large venture capital fund which raised a great deal of money a few years ago, and it looked as if it would last forever. We find now that at this stage they have made so many commitments to so many companies that their follow-on commitments to those same companies will probably have that fund fully invested within the next year, and they are actually looking at seeking some new money now, really several years earlier than we had expected.

I think all of us have financed and started so many companies in 1980 and 1981 that our present capital will be very fully committed to taking care of those, and we will need additional money.

Senator CHAFEE. How can the Federal Government help in the areas we have been discussing today? If all of you had one wish, what would it be?

I will start with Mr. Bell.

Mr. BELL. Treat capital gains in a manner that recognizes the type of investment made in a capital-gains investment.

In other words, currently when we invest in a company, we are investing normally in a private—not yet public; maybe someday will be—a private company that we will be invested in for several years, as many as maybe 10 or 15, more likely 6, 7, or 8. We think that is considerably more risky than buying stock on the New York Stock Exchange.

I think a 20-percent capital gains tax rate should distinguish between that kind of an investment, and perhaps it should be scaled down over the years so that if you held a position 10 years you end up paying a 5-percent gain on it, or none at some point.

Senator CHAFEE. So you wouldn't apply that to someone who has invested in General Motors, or something?

Mr. BELL. No, sir.

Senator CHAFEE. Listed securities?

Mr. BELL. No, sir. He can buy or sell at any time, and he's not taking the risk we take. Once we commit our dollars, we are locked

into that investment for quite a long time to come. Many things can change, and we may or may not ever get out of that.

Senator CHAFEE. How do you finally get out—when it's gone public?

Mr. BELL. Typically. Although frequently a smaller company that has shown remarkable growth will be acquired by a larger company. So it's usually one of three ways: The company goes public and then you sell out, over time, because usually you don't get out right away even under those circumstances, but you can at least recognize the gains on your balance sheet or in your portfolio, in terms of paper. You have got a stock that is now trading, and you have a value you can look at.

Senator CHAFEE. Percentage-wise, how large an investment do you make?

Mr. BELL. The percentage of the company we have invested in? That will range all over the lot. It can range from as high as some kind of control position, maybe of 50 or 60 percent, but more typically it's in the 5 or 10 or 15 or 20 percent area.

We invest, in my firm, and it's typical I think—we have two firms, both of which are approximately \$20 million in size—we invest \$250,000 to \$1 million per investment. It depends on the age of that company and its prospects as to what percentage of the company we get.

For \$500,000 in a brand new company with a whole new idea that hasn't produced a product or shipped anything, we may get 30 or 40 percent of that company. But if it's a company 2 or 3 years old that is shipping product, it's got a proven market, and it's got some leadership, perhaps we get 5 percent of the company for that much money.

Senator CHAFEE. So you'd take the scaling down of capital gains. How about Mr. Collins?

Mr. COLLINS. Well, my favorite one is capital gains, also. It boils down to reducing the effective rate of taxation on capital gains, whether it is directly or indirectly. And I would favor a kind of program that would allow you to roll over gains, as long as you invested in these same kinds of companies. It is these companies, after all, that are producing the benefits for the economy.

On a grander scale, of course—

Senator CHAFEE. Only one. You're only allowed one. [Laughter.]

Mr. COLLINS. Inflation is the real villain, let me just say that.

Senator CHAFEE. All right, Mr. Morgenthau?

Mr. MORGENTHAU. From a personal, selfish standpoint, I would support Mr. Bell's. That would be best for us as venture capitalists—a graduated capital tax on the period of time.

For the impact on the country as a whole, probably the rollover would do more good.

Senator CHAFEE. All right.

Mr. Doan?

Mr. DOAN. Well, I agree with those things. I will repeat that I believe the Government has a real role in funding these research universities, and I think that's what is the stem of all of it. So I guess I would put that in as the No. 1 thing.

Senator CHAFEE. Yes, I think there is an awful lot to that.

Mr. Pratt?

Mr. PRATT. Well, I agree with the funding of the research as important, but I've got to go with anything that will bring about the long-term orientation which, as I mentioned earlier, would be reducing the capital gains tax rates over a period of time.

You asked earlier about a specific thing on a tax program that didn't work. In the United Kingdom they have a tax scheme that gives you a tax credit as soon as you invest in something. This has been a disaster. It is measured by the amount of money that is put out rather than the bottom-line effect of that money. The important thing is the bottom-line effect.

Senator CHAFEE. That hasn't been suggested here, but thanks for mentioning it.

Mr. PRATT. Thank God it hasn't.

But it is the long-term disciplines that I think are extremely important.

Mr. ZSCHAU. I have a brief comment and a question for each of the panelists.

The comment is, I would like to commend again you, Senator Chafee, and your staff, for putting together what I consider to be the finest panel of venture capital people I have ever seen in a hearing room.

We have here three officers of the National Venture Capital Association; Mr. Doan doing innovative things in Michigan; and the guru of the venture capital industry, Mr. Pratt.

The question that I have is: There has been a lot of talk about reducing the holding period to qualify for capital gains from 1 year to 6 months. I was just curious, going down the panel, whether you feel that is a good idea and should be pursued from the standpoint of the objectives of these hearings—that is, promoting growth, and so forth.

Senator CHAFEE. Mr. Bell?

Mr. BELL. We don't oppose it, because it's not something that we think affects us a great deal one way or the other; because virtually everything we invest in we're in certainly longer than a year.

On the other hand, to the extent that having a shorter holding period treats the stock market with more liquidity, causes there to be more liquidity within that market, that ultimately has some effect, positive effect, on our investments—on their ability to go public, on the trading of their stocks in that market. So we don't see it as a bad thing, but it's not one of our objectives.

Mr. COLLINS. My answer is precisely the same as Mr. Bell's. It just doesn't matter in my organization at all. We are typically involved in an investment for 5 to 15 years; so whether a holding period is 6 months or 1 year or 2 years, it doesn't matter at all.

I also support the liquidity argument. One of things we have found in looking at thousands of companies is that to create an incremental dollar of sales in the kinds of companies that we are talking about here requires an incremental 50 cents to \$1 in assets.

So if you are going to get that company from \$50 million in revenue to \$100 million in revenue, you have to find between 25 and 50 million dollars' worth of assets somewhere.

You can get about half of it from your senior creditors, and the other half are what we call "equity." You may have other names for it, but it's really permanent working capital in the company,

and so indeed it is equity capital. And a lot of that capital, after a company reaches some maturity, comes out of the public markets. And to the extent that the public markets are improved by a shorter holding period, then in fact it helps that liquidity question.

Mr. MORGENTHAU. I would absolutely underscore and agree with what's been said. It has a very indirect effect on our businesses, not really important. It will improve the public markets, and to that extent we and the country are better off.

Mr. DOAN. I didn't know these guys were that smart. That's the most articulate description of that subject I've ever heard. I don't propose to add to it. [Laughter.]

Mr. PRATT. I'll just go out on the line a little bit further. As a matter of fact, I was scared I had a contract out on me from Wall Street when it was let be known that I was opposed to it. I had so many phone calls from people in Wall Street that I finally had to tell my secretary, "If they're Wall Street, throw 'em out."

I am opposed to it since my middle name is "long-term." I think we absolutely have to have the long-term commitment, and if you start giving that away it isn't going to help things.

Pension funds should be long-term investors. They are not; they are measured quarterly by Becker; their returns went down as soon as the Becker rating system became efficient.

Mutual fund returns went down as soon as they started getting into this daily trading all the time.

I believe we need some sort of a carrot or a club out there that is going to get people to hold on to something for a longer period of time. Building value takes time and patience.

Mr. ZSCHAU. I have no further questions, but I would like to thank you, Mr. Chairman, for permitting me to participate in these hearings.

Senator CHAFFEE. We're delighted to have such a distinguished and experienced member. You have made a real contribution, Ed, and we appreciate it.

I want to thank all of you.

I would like to mention one more thing about pension funds? Is the reason pension funds are not more active in giving you a hand, because they are managed by people whose orientation is toward listed securities?

Mr. BELL. Well, it's very difficult for a pension fund manager, who is largely compensated on a salary, to take much in the way of risk. And when he takes a small percentage of his pension fund and puts it with a venture capital fund, at least on the surface it appears as though he is taking an exceptional risk compared to the kinds of things that a pension fund invests in.

So it's a difficult decision for him to make. I think the pension funds that have participated to date in our industry have first of all had pretty good results, and I think that is causing some others to begin to be more optimistic and enthusiastic about it.

I think those who did early come into this industry were rather brave to have done so. They stuck their necks out, and I think they have happily been well rewarded in terms of the performance as a result.

You know, the pension fund industry is very large and growing very much larger. If it was to sort of open its coffers to the venture

capital community, it could be a disaster as opposed to a positive move.

So I think the very slow and cautious——

Senator CHAFEE. It could be a disaster for whom?

Mr. BELL. It could be a disaster for the pension funds and for the investment process. Too much money might in fact, then, be pouring into a very relatively limited amount of investment activity that is underway.

Senator CHAFEE. Mr. Pratt didn't seem to share that view.

Mr. BELL. No; Mr. Pratt said that there is not too much money today chasing too few deals. We don't know when and if that point might in fact eventually be reached.

I think if pension funds were across the board encouraged—there is \$750 billion in pension funds today, growing to about 1 trillion by the middle of this decade or late this decade. That's an awful lot of money and, if very much of that poured over into venture capital, there could be too much money chasing too few deals.

Senator CHAFEE. Mr. Morgenthau, what do you think of Mr. Bell's view?

Mr. MORGENTHAU. I think first I would like to add a point about your original question as to why the pension funds were very reluctant to do it.

First, it is the possible sense of loss of the money, as Mr. Bell indicated. There is a second point under ERISA, which is that these people can be held personally liable under the fiduciary requirements. That is what really frightened pension funds terribly away from venture capital type investments. And it has taken regulations out of the Department of Labor and others to caution them that it is, per se, a prudent investment. And that's what is necessary.

You know, it's one thing when a man looks at the question: If I lose money, I may get fired. But it's a second thing: When I lose money I may be held personally responsible for losing millions of dollars. That's what scared them to death.

In general I would agree with Mr. Bell's comment that we only need 1, 2, 3 percent of that money. I don't think more than that is going to flow over, but it is just too large a portion of the total savings in America to have people discouraged from making a very small percentage of their assets being invested into venture capital.

Senator CHAFEE. Mr. Pratt?

Mr. PRATT. OK. I'll comment on that very briefly; but pension funds last year were the leading source of venture capital into these professionally managed funds, again with \$474 million, which was more than double 1981's put-in and more than had been put in, in the prior 2 years.

Look back. What brought the pension money in was actually the clarification by the Department of Labor in 1978 that they would look at the total portfolio rather than at each individual investment within it. What stopped it was when they confused everything in 1979 with the proposed plan asset regulation.

Today more pension funds believe it is totally illegal for them to invest in venture capital than those who believe that it's legal.

A great deal of my business is advising and working with pension funds. There is a lot of misunderstanding, and if we can clari-

fy some of that, then they can look at it and make a logical, rational decision: Should 1 or 2 percent of their assets go into this?

I have one client who is putting 10 percent of their assets into venture capital pools, primarily because he does not want to have his company fund that pension fund with the operating earnings at all in 10 years. He believes he can do that with this sort of an aggressive posture, and believes it is prudent, in what he is doing, because of diversification.

Senator CHAFEE. Did Mr. Doan say you couldn't do it in corporate forms?

Mr. DOAN. Yes; that's right.

Senator CHAFEE. There is some confusion in this area; isn't there?

Mr. DOAN. Yes, there is. It needs clarifying.

Senator CHAFEE. All right.

Thank you very much for coming. I appreciate it.

Mr. Pratt, did you go to Brown?

Mr. PRATT. Yes, sir, I did.

Senator CHAFEE. Good. [Laughter.]

[Whereupon, at 1:18 p.m., the hearing was recessed, to reconvene at 9:30 a.m., Thursday, January 20, 1983.]

PROMOTION OF HIGH-GROWTH INDUSTRIES AND U.S. COMPETITIVENESS

THURSDAY, JANUARY 20, 1983

U.S. SENATE,
SUBCOMMITTEE ON SAVINGS,
PENSIONS, AND INVESTMENT POLICY,
COMMITTEE ON FINANCE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:32 a.m., in room SD-215, Dirksen Senate Office Building, Hon. John H. Chafee (chairman) presiding.

Present: Senator Chafee.

Also present: Senator John Warner.

Senator CHAFEE. Ladies and gentlemen, today is the second day of hearings on what Government—all levels of government—can do to help our growth industries, our high technology industries, succeed in the future.

We are engaged, in an extremely competitive situation in which the governments of other countries are investing substantial sums in their growth industries. The question is, What should we do? Some suggest, Just get out of the way and leave industry alone, and they will be able to succeed.

At yesterday's hearing, some of the suggestions were as follows:

First of all, the statement was made by many that our leading high technology industries are engaged in a struggle for survival and that the United States is losing out its leadership in certain technologies and facing the threat of future losses.

Among the suggestions: First, that the antitrust laws be changed to permit the creation of research consortiums. It was indicated that there can be such research consortiums now but it's extremely complex. Our antitrust laws were written nearly 100 years ago and should be changed to recognize what has happened over the last 10 years. Without the hamstring effect of the antitrust laws, there would be greater cooperation by industries in their research and development.

Second, there is a need for additional venture capital investment. Although there has been a remarkable increase in the availability of venture-capital funds since the change in the capital gains laws, a further reduction in the capital-gains rate would produce even more venture capital.

Third, the suggestion was made that we should seek ways to permit more pension fund investments in high technology ventures.

The vast sums that are available in the pension funds currently seem to be locked off from venture capital.

Fourth, the changes we made in the 1982 tax laws regarding stock options were detrimental. Stock options are extremely important in the entrepreneurial process and a vital part of the growth of these high technology companies. The suggestion was made that we should go back to the 1981 act,

Fifth, the failure in our educational process at the elementary, secondary and college levels with respect to math and sciences. The suggestion was made that all governmental levels should assist in restoring the capability of our youngsters in math and science. This would require greater research funds available for universities and other research activities.

Sixth, the need for retraining our workers in the so-called basic smokestack industries—the automobile and steel industries, for example. If they are going to be able to handle the jobs in these new technologies, there has to be some kind of retraining. While no specific ideas were offered, the suggestion was made that the Federal Government should do much more.

Today we are very fortunate in having a series of excellent witnesses. We look forward to hearing their testimony.

The first will be the Honorable Jerry Brown, the former Governor of California. Governor Brown worked hard in his State. California is the home of more high technology than probably any other State in the Nation. I don't know whether Massachusetts would dispute that, but nobody is here today from Massachusetts, so we are safe to say California is in the lead.

What we are interested in hearing from Governor Brown is what he actually did. How was he successful in stimulating the growth of these industries? Was it tax policies? Was it greater cooperation between the State government and the universities? I'm sure Governor Brown will be able to make a significant contribution.

So, Governor Brown, we welcome you here and appreciate your coming.

STATEMENT OF HON. JERRY BROWN, FORMER GOVERNOR OF THE STATE OF CALIFORNIA

Governor BROWN. Thank you very much, Senator.

The question that you asked is, How can Government policies generate and encourage the emergence of high-growth industries based on new technologies? The fact that we are even asking that question marks a fundamentally new period in American history.

When the technology companies in California took off, particularly in the 1970's, it was without any particular notice from Government except for educational policies, space programs, and military procurement. But the question of how Government fosters technological innovation wasn't asked, and obviously didn't have to be asked in order to liberate the creative energies that we now benefit from in so many new companies.

So, it strikes me that the most salient point about all this is that we are even talking about it in the first place. And that derives from the fact that there is a slowdown in the economic growth

process, there is an intensification of competition worldwide, and the erosion of some of our basic industries that you just mentioned.

Now, in the response to that, I don't believe you are going to come up with one statute or one technological fix, or one or two steps. What is required is a new vision, a new consensus, and a new discipline. We have to change our collective attitude as a nation if we wish to enter the aggressively competitive international marketplace that we are now in.

Every country that begins a century on top usually closes that century slipping back, and a very appropriate term for that process is, retarding-lead syndrome. Once you are in the lead, after a period, through complacency or other mysterious processes, you begin to slip, and you lose that dynamic attitude and commitment that previously propelled you to the top in the first place.

So, I would say that the first and most fundamental point is that the Nation needs a vision of where we are going for the rest of this century and beyond. And out of that comes a consensus, and out of that consensus will come a discipline that will permeate our schools, our factories, our public sector.

Now, trying to bring that down to a more practical basis is really the challenge of a political process. In California, we created a commission called the California Commission on Industrial Innovation. And its goal was to encourage winning technologies or, as I put it, a new industrial strategy for California and the Nation.

Now, what is unique about this—and I have a report that I have given to you that sets forth the results—is that, for the first time, representatives of organized labor, high technology industries, universities, and State government sat down to carefully assess what we do about this problem of economic growth and technological innovation. That is the first step. The Nation has to have a coming together of its labor representatives, its business representatives, its Government representatives, its university representatives, to chart a new agenda—or, as we called it, a strategy.

Now, although there were differences, there was a consensus on 50 separate points. And on page 57 and following, we lay out those 50 specific steps, some of which you mentioned in your introduction.

I would say that this is a very solid place to begin, and what has been done in California is already being emulated in several other States. And what I would like to see is all States pick this up, and even see it at the national level itself.

The difficulty that we are going to face is that, unlike our principal competitor, Japan, we don't have the homogeneity and the consensus by which we can devise such an economic strategy. That really is the challenge.

Now, there are some who are going to try to blame Japan for our problems, and they are going to try to see the problem elsewhere. I would say, instead of doing that, we should encourage the most imaginative among us to invent and produce and engineer the kind of competitive industry that we will be able to overcome any strategy, however coherent it is.

In Japan they have a 10-year strategy, put out by the Ministry of Industry and International Trade, (MIIT). They have sought as their No. 1 goal something that, if I had proposed it, would have

raised eyebrows. The term they use is, vitalized human potential. That comes right out of the 10-year MIIT plan; at least that's the translation I saw.

What they are aiming at is innovation. They are aiming at encouraging the very thing that characterizes the American economy. So, we already have it. All we need to do is encourage it, not smother it, and diffuse it and disseminate it through our society. That's where I think we really have to start, with a strategy aimed at taking what we already have and then trying to encourage it and magnify it.

Now, there are a lot of specifics within that: The R&D tax credit—you talked about that. That can be expanded and should be expanded so that it covers overhead and services—

Senator CHAFEE. When you refer to these tax matters, are you talking Federal and State?

Governor BROWN. Federal and State.

Senator CHAFEE. I am particularly interested in your State suggestions. I believe our States have to emulate what you have done in California if we are to succeed. You have done some innovative things and if you could point out where you have done them, tax-wise, it would be helpful.

Governor BROWN. All right.

We abolished the capital gains tax for companies with 500 employees or less. I don't see any reason why that can't be done at the national level.

Senator CHAFEE. Do you mean if you own stock in a company that has 500 employees or less—

Governor BROWN [continuing]. And you issue stock, and then you want to have a new stock issue, there is no capital gains if your stock is held for 3 years.

Senator CHAFEE. Hold it for 3 years.

Governor BROWN. Yes. Long-term capital gains targeted to small- and medium-sized companies, regardless of capital.

Senator CHAFEE. Did you restrict it? Did it have anything to do with the products of the company?

Governor BROWN. It is attempts to encourage companies that would be producing products, as opposed to collectibles, or antiques, or something like that.

So, there is a targeting by size and by nature of the company. And that is a very controversial issue in itself, but it's one that I would urge you to consider, because the point of targeting is—there is only so much money and, given the deficits, it is difficult to obtain a consensus for the complete elimination of the capital gains tax, and that is a way to take a next step that will have minimal impacts immediately on the revenues and will hopefully generate income and investment over the long term.

Senator CHAFEE. Is it your impression that that was a good stimulus?

Governor BROWN. I wouldn't try to measure the cause and effect at this point. I think all these things contribute. I certainly believe, at the national level, the reduction in the capital-gains tax has had an effect. Principally, the elimination in California is really meant as an example. The State income tax is not enough of a deterrent to affect things one way or the other, but I would say that the fact

that we've eliminated it sets an example of what should be done at the national level. And, to follow it up, I would say that it would have a definite incentive effect.

The next point that we make—well, the R&D tax credit and the capital gains are obvious ones.

Then there is another source of capital, and that is the pension funds. There are \$300 billion in public pension funds, and only a fraction of that goes into growth companies, much less into venture capital efforts.

I recommend that a small risk for even a prudent pension fund is prudent, and therefore, 1 percent is reasonable to invest in venture capital, and 3 to 5 percent and maybe higher is reasonable to invest in growth companies.

Many of the public pension funds have restrictions against investment in companies that don't pay dividends but rather reinvest them in further growth, and many States restrict pension fund investment in venture capital—in fact, most of them do.

I have a report, titled "Targeting Investment for Economic Development," where we surveyed all this and laid out pretty much what ought to be done and what can be done by way of utilizing the \$300 billion in public pension funds. So, if you will only pick up but a fraction of that, that will significantly increase the amount of venture capital available.

There are other changes that one could make in the banking laws to encourage greater investment in equities, and that may be a little more controversial, but it also opens up a new source of capital.

Of course, all the capital in the world is not going to make a difference if there aren't smart people to utilize the capital. So, inevitably, when you talk about innovation, you have to talk about education and training.

Another document that I submitted to you, titled "Investment in People: A California Agenda for Education and Training in the Eighties," lays out a program affecting grammar schools, high schools, colleges, university research, and training of displaced workers, and the introduction of computers in schools, the evaluation of software, and the training of teachers. That is laid out there. I think it is an essential effort.

What I would say, in that respect, is that the very tools that are undermining basic industries, both domestically and internationally, are the very tools that are going to get us out of the problem, and that is the use of the electronic equipment, the computers, and various communication technologies, to make us more productive and more competitive.

But, in order to make use of all of that, we have to have the engineers, the scientists, and the trained people.

Japan, with half our population, graduated more engineers than we did. That is something that has to be overcome, and really the amount of money is not large to increase the Federal support for graduate fellowships and other federally sponsored research. If you added \$300 million, \$500 million, it would make a very profound effect on the schools that are having such financial problems. And, there is no way we can compete if we don't graduate more trained

engineers. And that's in the computer sciences, in process engineering.

In many respects, we are doing quite well at innovation, but we are being outmanufactured. And, there is no reason why America can't outperform the Japanese in manufacturing. It's just a matter of having the trained people to do the work—the engineers, the technicians—and what some people call an equivalent financial environment; namely, a cost of capital similar to what our competitors have.

That gets into some more complicated issues, but the main point I want to make is that education at all levels has to be taken into account when you are looking at the innovation process.

One final point I want to add here is the training of people. Another document I want to give you is a report on what is called, California Worksite Education and Training Act, or an acronym, CWETA.

Now, CWETA differs from CETA in the following respect: Instead of providing money to train workers, irrespective of a specific company or job, CWETA starts the process with the employer.

The employer identifies a skill that is missing for a particular job that is already in existence. So, the specific employer, whether that's Hewlett-Packard, or Rockwell, or Teledyne, or Hughes, comes to the State and says, "We need the following skills: We need 200 people who are electronic assemblers." Then the State provides money and, with the specific employer and a local community college, designs a training module.

Another way to put this is, this is a generic form of apprenticeship. And, what I see as a very important change that is going on is that, while we got away from the apprenticeship concept over the last 50 years, we are not going to get back into it. Lawyers, doctors, as well as electricians and plumbers, were trained through the apprenticeship process. Then, as the theory became more complicated, the schooling system took over, and many, many years of schooling became the primary training place.

It strikes me that with the advances in computers, the data bases that are going to become available, theoretical knowledge can be taught in the work environment itself, and I believe that what has to happen is that a greater connection has to be made between the work environment—the factory floor—and training itself.

I would venture to say that if you examine what goes on in an American factory and in a Japanese factory, there is more training and more learning and more engineering going on on the factory floor than is occurring in this country.

So CWETA takes that concept and works on a worksite training. It is very specific. And in many ways the companies should be doing this themselves, but this provides a catalyst so that we stimulate the process, and that's after all the principal thing that government can do.

So if you put all that together, you could break it down in the following way:

You have to have the capital. You do that through tax incentives, the changing of banking laws, and the changing of the State public pension laws—and some of that is State and some of it is Federal.

Then you have to have the adequate educational process, which is the emphasis on the requisite skills, the technological literacy, and the primary and secondary schools. And one very important way to do that is you have got to pay the teachers adequately, you have to have the computers in the schools so that the basic tools are learned at an early age, and then you have to have the research and the engineering and the math and the science in the universities. And the Federal Government has to put up more money than it is presently committed to doing, and the States must do the same thing.

Along with the formal university educational system, you have to have a parallel connected system of training, and that training ought to be not at separate locations so much as a part of a work-site network that will utilize the existing school structure—community college adult schools, night schools, private training—but tied into the actual job itself, the work place, the factory floor. And out of that we can upgrade the quality of work.

Now, when you put all that together we are really talking about—it really is a new vision. It's a new consensus. And it requires a new discipline. Because the ultimate point is that we have to work harder, we have to be smarter, and we have to act in a collective way as a nation in a manner that we have never done before.

The analogy I would close with is this: After World War II the principal challenge was viewed as the expansion of Soviet communism. And the response was a bipartisan foreign policy. President Eisenhower, Lyndon Johnson, Sam Rayburn were generally in agreement about what had to be done with respect to foreign nations. And our foreign policy was built around some basic principles.

It strikes me that our principal challenge today is the obsolescence of basic industry, the undertraining and undereducating of our work force, the changing demographics of our aging society, such that we have a 5-percent slice of the global population that is aging, and we are now forced to compete with countries that are as sophisticated as we are on the one hand, and then we are forced to compete with cheap labor markets on the other.

The only way to respond to that is with a bipartisan domestic economic policy. Now, I don't expect that to occur overnight, but if it is true that the challenge is no less focused and no less real than what was faced after World War II with respect to the Soviet Union, and I think it is, then our response has to be equivalent. That requires a national strategy; it requires a bipartisan domestic economic policy.

I would hope that this Committee can work with some of the committees that have been treating similar issues in the House, and the partisan differences that will always be there can be incorporated within this larger vision, because it's only in that manner that we will be able to compete with Japan or France or Germany, or even some of the other smaller countries that are beginning to undermine and penetrate our markets, not just in steel or autos but in semiconductors, in tool and die, and in all sorts of other basic products and processes that determine the underlying American prosperity.

Thank you very much.

Senator CHAFEE. Well, Governor, thank you very much. That is really an excellent statement, and I couldn't agree with you more. You and I are singing in the same choir, and I appreciate so much your coming.

I have several questions.

You mentioned capital formation, the change in our tax laws, and the pension funds. These are all very good points. With respect to pension funds, apparently the law seems to be confused as to what they can and can't do.

You mentioned the banking laws. Was there anything specific that you thought of in connection with the banking laws?

Governor BROWN. Well, the prohibition on investment banking by commercial banks.

To emulate what is going on in the Japanese system, where the banks play a much bigger role in the investment of capital, you would have to change some of the Federal laws on that.

Senator CHAFEE. Tell us more about the CWETA program.

Governor BROWN. CWETA, California Worksite Education and Training Act. If you look in the back of that, it has the specific companies and how many were trained, and how much it cost, and what local community colleges were involved. So it's very specific. In fact, there's a graph on page 29 that indicates where it went. Forty-seven percent went to electronics and other technical fields, 14 percent went to health care, and 22 percent went to skilled crafts.

Basically what it is, it makes a partnership of business and government, it breaks down the adversarial relationship, and it doesn't create any waste because the process begins with the existence of a job, and the job drives then the training in order to fulfill it.

I don't believe there is anything on the national level like this.

Senator CHAFEE. No; there is not.

Do you think it's best for these to be done on the State level or on the Federal level? Let's assume the Federal Government is willing to put some money in this type of program. Would you prefer that the Federal Government help subsidize a State-operated program, a State-conceived and operated program, or should we, the Federal Government, establish our own program.

Governor BROWN. Well, I would say the States ought to do it, and the States can do it; but since there is no monopoly on wisdom, the Federal Government can perform a very useful service if it would finance the same kind of effort.

The way I would do that would be to fund for 3 years programs such as this at a relatively modest amount, and then let the States pick it up from there.

Essentially, business has to train its own people, but there are times when government can provide an incentive or act as a catalyst, and I think that's what this is.

I believe that what is going to happen long-term is that the community colleges and the high schools are going to reshape their curricula. So what this basically is doing is driving the activity of local schools.

Now, it's a rather odd process that spends tens of billions of dollars educating people, and then after they are finished and out of high school, then you reeducate them in something called Worksite Education and Training. The ideal, in my judgment, would be that this goes on in high school. There is no reason why it shouldn't. There is no reason why young people—15, 16 years of age—can't learn right on the job and can't have that high school education and work tied together, because then the training is more closely related to the real world of work.

So what the Federal Government could do would be to encourage this process, but ultimately this ought to be incorporated into the structure of the schools. Now, the reason why it isn't is because the nature of work is changing faster than the nature of education. The private sector has more flexibility, driven by the market, than the educational process. So this is really a means of intervening in the education training process to make it more responsive to the kind of jobs that are available.

So that would be the reason why I believe the Federal Government could quite easily invest some money in this process.

Senator CHAFEE. You mentioned that when you set up these groups, you had business and government and organized labor.

I was curious about the presence of organized labor. These industries are basically unorganized, aren't they?

Governor BROWN. Yes. Well, it was curious, because this was the first time that some of the businessmen ever sat at the same table with representatives of organized labor.

Now, on the issue of organization, there is a fundamental disagreement. Most of these individuals, one of whom will be here to speak for himself, I'm sure is not interested in having his plant organized.

Senator CHAFEE. That's not unique.

Governor BROWN. No; it's not unique.

But the fact that you can disagree about that doesn't mean you can't agree on the need for a more favorable environment for innovation, better incentives for capital formation, better training and education in the schools and universities, and the retraining of workers displaced by foreign competition or obsolescence.

People do agree on that. In fact, I would say that the No. 1 thing that the representatives of labor agreed on was the training and the retraining. So if you just focus on that point, you will get some agreement. If you want to discuss labor law reform, you are going to get a lot of disagreement; and therefore we didn't bring that topic up.

But there is enough to agree on that it's worthwhile sitting down and making that occur; because I really believe that the fundamental need is a consensus that derives from some shared principles, and that consensus does not exist today.

Between labor and business there are some different languages being used, there are different habits of thought, and until those barriers can be overcome, I believe that we are just going to stumble along and not get maximum out of our society that I think we are capable of.

Senator CHAFEE. In your comments, you took a somewhat different view regarding protectionism than some of the leading lights of

the Democratic Party. They have advocated a line that is far more protectionist than you have suggested. I agree with your position and find your comments to be extremely helpful.

In your opening remarks you stated, 'Let's get out there and compete.' The United States doesn't need a protective cloak against imports.

Governor BROWN. Well, there are really two points I want to make on that.

No. 1, I believe Japan is being made the scapegoat for what we ought to be doing ourselves. That's a very easy out.

Senator CHAFEE. Apparently, their crime is that they are producing a better automobile.

Governor BROWN. Well, they are producing a better industrial strategy that produces better automobiles. And until we at least try our hand at that, we shouldn't blame them for their success. We ought to find our own pattern and method of operating that will do the job better.

Now, there are deficiencies in the trade. And then, one point that I haven't mentioned is the exchange rates. If there is a 20 or 30 percent difference, as there now is, between the yen and the dollar, we are going to find it very difficult to compete.

So that whole matter of making sure that there is a proper relationship between our currencies, that's fundamental.

Senator CHAFEE. What can we do about that? How can we make the Japanese devalue their yen, or upvalue it?

Governor BROWN. Well, I suppose if we were able to get our own house in order that our dollar would perhaps—I think if we are more competitive, I think we are going to have to let our own dollar get a little closer to other currencies that it's appreciated against. And we will probably do that, under the present operation, fairly quickly, given the fact that there is now a deflation going on that may just take place in the next couple of years.

I think that is an area of tension that the President, hopefully, is working on with the Japanese. And I guess I don't have a good answer to how you get the Japanese to change their policies. Obviously they want their yen weaker so they can have a more favorable position in our markets, and our goal ought to be to try to overcome that.

But the concern I have is this, that if we don't handle the Japanese relationship right, then we risk damaging an alliance that is central to the whole Western prosperity. And if we alienate Japan, there is no reason why Japan can't work with China or Russia and move totally in a different orbit.

So, because of oranges and steaks, if we get into a fight that recreates the problems of the thirties, that will be a fundamental error.

There are problems. There is the problem that they do focus their capital, they have government and banks backing up some of their industries, they target. We have to respond to that. But instead of just responding with trade barriers, we could employ similar techniques to overcome it—and we do some of that with the Export-Import Bank. That is a very controversial issue, but I think that would be preferable to tariffs. And then, I think the general support of the more vigorous trading environment is what we need.

So it is not easy, but I think that the scapegoating of Japan is very dangerous from both an economic and even a security point of view, and we have probably gone even further than we should have, even at this point.

Senator CHAFEE. I certainly agree with you. It's very easy to kick the Japanese around to explain some of our own deficiencies. But that doesn't solve our problems here.

Governor BROWN. There is one other point on that. The workers who are out of work, who see the foreign cars and the foreign television sets, they are bearing the full brunt of a lack of industrial strategy in this country.

So it isn't really fair for working people to be the sacrificial victims in this whole economic process. And the protectionism is really a more simplified expedient to deal with that obvious injustice.

But what I am suggesting is that if we were to have the proper incentives for new technology, the retraining, and a proper trading strategy, then we should be able to transition workers from one industry to another, to have the proper training, and some kind of a system to provide a safety net or some kind of job security that doesn't now exist.

And if the job insecurity level rises, then the protectionism is an inevitable result. So I think that's the driving force behind this protectionism, and I'm sure it will occur if we don't come to grips with the 10-percent unemployment rate.

Senator CHAFEE. Finally, I think it is clear from your testimony that your universities, State and private universities, have played a very fundamental role in California's success with their high technology industries.

Governor BROWN. Fundamentally, the presence of Stanford, University of California, CalTech have made the difference. That's why all this occurred. People weren't talking about industrial strategies or technological innovation, but people were busily encouraging and contributing to and supporting those great universities. And out of that has come all the people who have invented the semiconductor, the microprocessor, and all the rest of the tools that are now driving all of this.

Senator CHAFEE. Thank you very much, Governor. You gave a very, very clear presentation of the overall challenge.

Is there anything else you want to add?

Governor BROWN. Yes; I do. I left one point out, the issue of exchange rates. I know that's a little beyond this, but just as a summary point:

Probably what is required is some kind of new Breton Woods re-drawing of the monetary relationships. And I was thinking about that. How do you bring into line the yen and the dollar and various other currencies? The dollar is the world reserve currency, and we are bearing the full brunt.

Now, just on a bilateral relationship you probably can't do it. But at some point, given the kinds of financial problems that are out in the world today, this country ought to embark upon a new monetary system that would be the result of some kind of a new Breton Woods arrangement. We set something up after World War II, it

has been progressively eroded, and that is a fundamental part of this business of getting more competitive.

The exchange rates—you can ask workers to not take pay raises for 3 years, and that won't equal the effects of changes in the exchange rates.

So that has to go, with all the rest of this stuff, in order to make the country competitive with our economic allies, or adversaries.

Senator CHAFEE. I suppose, though, that any changes in upvaluing the yen as opposed to the dollar may be good for us. On the other hand, however, it is going to be harmful to the Japanese exports. So, seeing it from their side——

Governor BROWN. But if more countries are involved in it, then it's possible to set up some new groundrules for international monetary policy.

There was an attempt. I believe the administration now is moving to a more active role in monetary intervention on an international basis, and that's a step away from where it was 2 years ago. So it seems to me that the next step would have to be a convening of the Western nations to create a more stable and predictable set of relationships in our respective currencies.

[The prepared statement of Governor Edmund G. Brown Jr. follows:]

GOVERNOR EDMUND G. BROWN JR.

TESTIMONY

BEFORE THE

SENATE FINANCE COMMITTEE

Subcommittee on

Investment

January 20, 1983

Thank you very much Senator Chafee. You asked a very interesting question -- How can government policy generate and encourage the emergence of high growth industries based on new technologies? The fact that we're even asking that question marks a fundamentally new period in American history.

When the technology companies in California took off, particularly in the '70's, it was without any particular notice from government except for space programs and military procurement. The question of how government fosters technological innovation wasn't asked. And, obviously, it didn't have to be asked in order to produce the unprecedented advances made by American electronics companies.

We are talking about it now because there has been a slowdown in the economic growth process. There has been an intensification of competition worldwide and a continuing erosion of some of our basic industries. In the face of such a challenge, can our industries respond? And, can government help them respond?

What is required is a new vision, a new consensus and a new discipline. We have to change our collective attitude as a nation if we wish to succeed in the aggressively competitive international marketplace that we now confront.

Countries that enter a century on top usually close that century slipping back. A very appropriate term for that process is "Retarding-lead Syndrome." Once you're in the lead, after a period of complacency, you begin to slip and to lose that dynamic attitude and commitment that propelled you to the top. To counter this tendency toward complacency, I would say that, first, our nation need a vision of where we are going for the rest of this century and beyond. Out of that vision will come a consensus. And, out of that consensus will come a discipline that will permeate our schools, our factories, our public sector.

' Bringing that vision down to a more practical basis is the challenge of the political process.

PUBLIC/PRIVATE PARTNERSHIPS

In California, we created a commission called the California Commission on Industrial Innovation. A report of its findings will be submitted to the Committee. Its goal was to encourage winning technologies, or, as I put it, to develop the new industrial strategy for California and the nation. What is unique about this effort is that for the first time representatives of organized labor, high technology industries, universities and state government sat down to assess what we do about economic growth and technological innovation. So, that is the first step. The nation has to have a coming together of its labor representatives, business representatives, government representatives and university representatives to chart a new agenda, or as we called it, a strategy.

Although there were differences, the group did agree on 50 separate recommendations for state and federal action. I would say that these 50 recommendations would be a solid place to begin to address the national slowdown in technological innovation. Although, several states have already begun to emulate what we did in California, I believe every state, as well as the federal government, should create commissions of business, labor, university and government representatives to forge a new consensus on the policies needed to encourage innovation.

The difficulty we face in forming such a consensus is that, unlike our principal competitor, Japan, we do not have the homogeneous community through which we can devise a national economic strategy. Our challenge is to create consensus in a society characterized by an extraordinary degree of individualism.

Some are going to blame Japan for our problems - they're going to look abroad instead of within. I would say that instead of doing that we should encourage the most imaginative among us to invent, produce and engineer the kind of competitive industry that will be able to overcome any strategy put out by the Japanese Ministry of International Trade and Industry (MITI). MITI has sought as its number one goal "vitalized human potential." What it is aiming at is innovation. Thus, the Japanese are seeking the very thing that made the American economy. We already have it. All we need to do is to encourage it, not smother it, and to diffuse and disseminate it throughout our society.

That's where I think we really have to start: with a new strategy aimed at taking what we already have and then trying to encourage it and magnify it.

CAPITAL FORMATION

Now, let's get to the specifics: First, the R&D tax credit. It should be expanded so that it covers overhead and services. It certainly should cover software.

Second, we should abolish the capital gains tax on long-term productive investments. In California, we abolished the capital gains tax on certain investments held for longer than three years in companies of 500 employees or less. I don't see any reason why that can't be done on the national level. This type of targeted tax reform encourages capital formation and long-term investment as opposed to speculative and short-term profit taking.

The targeting of tax benefits is a very controversial issue but it's one that I would urge the Committee to consider. The reason to target is that there is only so much money, given current deficits. It is difficult to obtain a consensus for the complete elimination of capital gains taxes. So, one logical next step is to target the tax reduction in a way that will have a small impact on federal revenues but will encourage sound investment over the long-term.

A third source of capital for innovation is the pension funds. There's \$300 billion in public pension funds in the United States and only a fraction of that goes into growth companies, much less into start-ups. I recommend that a small risk capital fund be formed by public pension funds. One percent is reasonable to invest in venture capital and three to five percent is reasonable to invest in growth companies. Many of the public pension funds have restrictions against investments in companies that don't pay dividends but re-invest in further growth. Many states also restrict pension fund investment in venture capital. These restrictions should be changed.

I am submitting to you a report, prepared by the California Pension Investment Unit, called Targeting Investment for Economic Development. It describes actions which the states and federal government could take to free up the \$300 billion in the public pension funds to increase the amount of capital available for growth.

EDUCATION AND TRAINING

Let me hasten to say that all the capital in the world is not going to make a difference if there aren't smart people to utilize the capital. So, inevitably, when you talk about innovation you have to talk about education and training.

Another document that I am submitting to the Committee is called Investment in People. It's the California program for education and training in the '80's. This program encompasses grammar schools, high schools, colleges, university research, the training of displaced workers, the introduction of computers in schools, the evaluation of educational software and the training of teachers, and a CCC Program to provide jobs in public services for young men and women.

The tools that are undermining basic industries, both domestically and internationally, are the very tools that will solve the problem. The sophisticated use of electronic equipment, computers and various communication technologies in basic industries will increase their productivity and competitiveness.

But, in order to make use of these technologies we have to have the engineers and scientists. Japan, with half our population, graduates more electrical engineers than we do. That's something that simply has to be overcome. To usefully increase the federal support for graduate fellowships and other federally sponsored research would cost no more than \$500 million. Yet, such an expenditure would have a profound effect on American schools. There's no way that we can compete if we don't graduate more trained engineers in the fields of computer sciences, process and electrical engineering. In many respects, we're doing quite well in innovation but we're being out-manufactured. Japanese engineers on the factory floor are increasing productivity by emphasizing innovation in the manufacturing process itself. There's no demographic, financial, cultural or political reason why America can't outperform the Japanese in manufacturing. It's just a matter of having the national will and the trained people to do the job.

Education at all levels has to be taken into account if we are to improve the innovation process. A major component of our economic strategy is the training of people. Another document I am presenting to the Committee is a report on the California Worksite Education Training Act (CWETA). CWETA differs from CETA in the following respect: instead of providing money to train workers, irrespective of a specific company or job, CWETA starts the process with the employer

identifying a skill that is missing for a pre-existing job. The specific employer, whether it's Hewlett-Packard, Rockwell, Teledyne or Hughes, comes to the State and says we need 200 electronic assemblers. Then the State provides money and, together with the specific employer and a local community college, designs a training module.

This is a generic form of apprenticeship. Society has moved away from the apprenticeship concept over the last 50 years, but is now returning to it. Lawyers and doctors, as well as electricians and plumbers were trained through the apprenticeship process. Then, as the tasks became more complicated, the schooling system took over and became the primary training place. It strikes me that with the advances in computers, appropriate software will become available so that theoretical as well as practical learning will be brought back to the work environment itself, making apprenticeship an effective way to train people.

An important difference between American and Japanese factories is that more training and more innovating are going on in Japanese factories than in our own. CWETA addresses this disparity and develops worksite training programs.

So, putting these proposals together, they break down in the following ways:

- (1) We have to have the capital for growth. This includes tax incentives, reform of banking laws and changes in the states' public pension laws;
- (2) We have to have an educational process which emphasizes clear thinking, basic skills and technological literacy at the primary and secondary levels. Among the keys to success are adequate pay for teachers and computers in schools;
- (3) We have to have fully financed and high quality engineering, math and science in the universities;
- (4) Along with the formal education system, we need a parallel system of training that will utilize the existing school structure -- community colleges, adult schools, high schools, private training -- but tied in with the actual job itself, the work place. Out of this integrated work-school process the quality of work will be upgraded and meet international standards.
- (5) The federal government must provide more money and the states must do the same.

What I am really talking about is a new vision. A new consensus. And this requires a new discipline. We have to work harder, we have to be smarter and we have to act as a nation with clear purpose.

I would close with this analogy. After World War II the principal challenge was seen as the expansion of Soviet communism. The response was a bipartisan foreign policy. President Eisenhower, Lyndon Johnson and Sam Rayburn found agreement about what to do with respect to foreign nations. Our foreign policy was built on shared principles and a common purpose.

Today our principal challenges are the obsolescence of basic industry, the under-training and under-educating of our workforce, the aging of our society and the unavailability of capital on terms equivalent to that enjoyed by our foreign competitors.

The only way to respond is with a bipartisan domestic economic policy. I don't expect that to occur overnight, but if it is true that the challenge is no less than that which we faced after World War II with respect to the Soviet Union, then our response must be equivalent. This requires a national strategy, which as of 1983, does not exist.

I believe that this Committee can work with other similar committees in the House and overcome partisan differences to create this larger vision. Only in this way will America compete with Japan, France and Germany which are penetrating our markets, not just in steel and autos but in semiconductors, machine tools and other basic products and processes that determine American prosperity.

Thank you very much.

B I B L I O G R A P H Y

- "California Worksite Education and Training Act: An Economic Strategy That Works." Edmund G. Brown Jr., Governor, State of California, 800 Capitol Mall, Sacramento, California 95814, December, 1982.
- "Investment in People: An Update, A California Agenda for Education and Training in the 80's." Edmund G Brown Jr., Governor, State of California, 800 Capitol Mall, Sacramento, California 95814, January 1, 1983.
- "The Vision of MITI Policies in 1980's; Trade and Industrial Policy for the 1980's." Industrial Research Dept., The Industrial Bank of Japan, Limited, March, 1980.
- "Winning Technologies: A New Industrial Strategy for California and the Nation." State of California, Office of the Governor, State Capitol, Sacramento, California 95814, September, 1982.

APPENDIX

The following documents are referred to in Governor Brown's testimony:

1. "Report of the California Commission on Industrial Innovation - Winning Technologies: A New Industrial Strategy for California and the Nation." September, 1982.
2. "Targeting Investment for Economic Development." December, 1982.
3. "Investment in People: An Update - A California Agenda for Education and Training in the 80's." January 1, 1983.
4. "California Worksite Education and Training Act: An Economic Strategy That Works." December, 1982.

The Governor also made reference to the strategic plans of the Japanese Ministry of International Trade and Industry (MITI). For a detailed statement of MITI's plan, see: "The Vision of MITI Policies in 1980's: Trade and Industrial Research Dept., The Industrial Bank of Japan, Limited, March, 1980.

For copies of the above, call Allison Thomas at the National Commission for Industrial Innovation, 1125 West Sixth Street, Third Floor, Los Angeles, California 90017, (213) 481-2270.

Senator Chafee: O.K. -- Now these programs that you initiated out there --

Governor Brown: CWETA -- California Worksite Education and Training Act -- if you look on the back of that booklet it has the specific companies and how many were trained and how much it cost and what local community colleges were involved. And there's a graph on Page 20 that indicates in which fields people were trained. Forty-seven percent in electronics and other technical fields. Fourteen percent in healthcare and twenty-two percent in skilled crafts.

Basically, what CWETA does is to create a partnership between business and government. It breaks down the adversarial relationship. It doesn't create any waste because the process begins with the existence of the job and the job drives the training process. I don't believe there is any such program on the national level.

Senator Chafee: No. Now, the question is going to come up -- do you think it's best for it to be handled on the state level or on the federal level? Let's assume the federal government is willing to give us the money in one way or another. Would you prefer that the federal government help subsidize a state operated program, training program, or should the state try and do it itself or should we try and do it ourselves?

Governor Brown: Well, I would say that the states ought to do it. The states can do it. But, since there's no monopoly on wisdom, the federal government can perform a very useful service if it would finance the same kind of effort on a pilot basis. The way I would do that would be to fund for three years a program such as this, at a relatively modest amount, and then let the states pick it up from there.

Essentially, business has to train its own people. But there are times when government can provide the same or act as a catalyst. And, I think that's what this is.

I believe that what is going to happen long-term is that the community colleges and the high schools are going to reshape their curriculum. So, what CWETA basically is doing is deriving the activity of local schools.

Now, it's a rather odd process to spend tens of billions of dollars educating people and then after they're finished and out of high school you re-educate them in something called worksite education training. The ideal, in my judgement, would be that this job training goes on in high school.

There's no reason why it shouldn't. There's no reason why young people 15 to 16 years of age, can't learn right on the job and can't have that high school education and work tied together. Because then the training is more closely related to the real world of work.

So, what the federal government could do is to encourage this process. Ultimately, this type of training ought to be incorporated into the structure of the schools. The reason why this has not happened already is because the nature of work is changing faster than the nature of education. The private sector has more flexibility than the educational process. So, CWETA is really a means of intervening in the education training process to make it more responsive to the kind of jobs that are available. That would be the reason why I believe that the federal government could quite easily invest some money into this process.

Senator Chafee: You mentioned that when you set up these groups when you were involved in your Winning Technologies, the report that your group composed, you had business and government and organized labor.

I was curious about the presence of organized labor, in that these industries are basically unorganized aren't they?

Governor Brown: Yes. Well, it was curious because I think this is the first time that some of the businessmen ever sat at the same table with representatives of organized labor. Now, on the issue of organization, there is a fundamental disagreement.

But the fact that you can disagree about that does not mean that you can't agree on the need for a more favorable environment for innovation, better incentives for capital formation, better training and education of the schools and universities and the retraining of workers displaced by foreign competition or obsolescence. Investing in people, you agree on that. In fact, I would say that the number one thing that the representatives of labor agree on was the training and education; and, so, if you just focus on that point you'll get some agreement.

Because I really believe that the fundamental need in our country is for a consensus that derives from principle. That consensus does not exist today. And, between labor and business some different languages are being used and different habits of thought. Until those barriers can be overcome, I believe that we're just going to stumble along and not get the maximum amount of our society that we're capable of.

Senator Chafee: Now, in your comments you took a somewhat different view with regard to protectionism than some of the leading lights of the Democratic party. They advocated a line that is far more protectionist than you've suggested. I agree with your position and I'm not going to have these positions set as opposed to the Democratic candidates. But, it just seems to me that your comments were extremely helpful.

In your opening remarks you stated, "Let's get out there and compete." We can do it in the United States. We don't need a protective cloak against imports.

Governor Brown: Well, number one, I believe that Japan is being made the scapegoat for what we ought to be doing ourselves. That's a very easy way out.

Senator Chafee: Their crime is that they're producing a better automobile?

Governor Brown: Well, they're producing a better industrial strategy that produces better automobiles. And, until we at least try our hands at that we shouldn't blame them for their success. We ought to find our own pattern of operating, then we will do the job better.

One point that I haven't mentioned is the exchange rates. Now, there's a 20-30 percent difference between the yen and the dollar. Until that changes, we're going to find it very difficult to compete.

Senator Chafee: Well, what can we do about that? How can we make the Japanese devalue the yen, or upvalue it?

Governor Brown: Well, I suppose if we're able to get our own house in order, I think we're going to have to let our own dollar get a little close to other currencies that it's appreciated against. And, we'll probably do that under the present operation very quickly, given the fact that there is now a recession going on. I think that is an area of tension that the President, hopefully, is working on with the Japanese and I guess I don't have a good answer as to how you'd get the Japanese to change their policy. Obviously, they want their yen to become weaker so they can have a more stable position on our markets and, hopefully, we will be able to overcome that.

The concern I have is this: if you don't handle the Japanese relationship right then we risk damaging an alliance that is central to western prosperity. And, if we alienate Japan there is no reason why Japan can't work with China or Russia and move totally into a different orbit.

. Because of oranges and steaks we get into fights that recreate the problems of the '30's and that would be a fundamental error.

There are problems. There's a problem that they do focus their capital. They have government and banks backing up some of their industries. They target, and we have to respond to that. But, instead of just responding with trade barriers we could employ similar techniques to overcome it -- we could do some of that with the Export/Import Bank.

So, it's not easy but I think the scapegoating of Japan is very dangerous from both the economic and the security point of view and we've already gone a little further than we should have.

Senator Chafee: Well, I tend to agree with you. It's very easy to kick the Japanese around to explain some of their own deficiencies. But that doesn't solve our problem.

Governor Brown: There's one other point on that. The workers who are out of work, seeing Americans buy foreign cars and foreign television sets, are bearing the full brunt of a lack of industrial strategy in this country. It really isn't fair for working people to be the sacrificial victims of this whole economic process. Protectionism is a quicker expedient to this problem than some of the others that I've mentioned.

What I'm suggesting is that if we were to have the proper incentives for new technologies, a complete retraining program and a proper trading strategy, then we should be able to transition workers from one industry to another, to properly train them and to fund a system which provides some kind of job security or safety net that does not currently exist.

Without these programs, unemployment rises, and protectionism is inevitable.

Senator Chafee: I think that it's clear from your testimony that certain universities, state and private universities, have played a very fundamental role in the success of California's high technology industries.

Governor Brown: Fundamentally the presence of Stanford, University of California, Cal Tech have made the difference. That's why Silicon Valley and the information revolution occurred.

People weren't talking about "industrial strategies" or "technological innovation," but people were busily encouraging,

contributing to and supporting those great universities. And out of that has come all the people who have invented the semiconductor, the microprocessor and all the rest of the tools that are now driving all of this.

Senator Chafee: Well, thank you very much, Governor. We really appreciate what you've done, your contributions here. You gave a very, very clear presentation of the overall challenge.

Is there anything else you want to add?

Governor Brown: Yes, I do. I left one point out, the issue of exchange rates. I know that's a little beyond the scope of this hearing, but let me add one point.

Probably, what is required to equalize the dollar and the yen, is some kind of new Bretton Woods redrawing the monetary relationships. How do you bring into line the yen and the dollar and various other currencies? The dollar is the world reserve currency, and we are bearing the full brunt.

You probably can't reform the monetary system purely through bilateral relationships. But at some point, given the kinds of financial problems that are out in the world today, this country ought to embark upon a new monetary system that would be the result of some kind of new Bretton Woods arrangement. We set something up after World War II, it has been progressively eroded, and that is a fundamental part of this business of getting more competitive.

Many people say the reason we're not competitive is because our labor costs are too high. But, you can ask workers to not take pay raises for three years, and that won't equal the effects of changes in the exchange rate.

So, we must change this imbalance in order to make the country competitive with our economic allies, or adversaries.

Senator Chafee: I suppose, though, that any changes in up-valuing the yen as opposed to the dollar may be good for us, but on the other side of the coin, I presume it is going to be harmful to the Japanese exports, their abilities. So, seeing it from their side --

Governor Brown: But, if more countries are involved in it, then it's possible to set up some new groundrules for international monetary policy.

There was an attempt. I believe the Administration now is moving to a more active role in monetary intervention on

an international basis, and that's a step away from where it was two years ago. So, it seems to me that the next step would be to convene the Western nations to create a more stable and predictable set of relationships in our respective currencies.

Senator Chafee: All right, fine. Well, thank you very much Governor. I appreciate your being here.

Senator CHAFEE. Again, thank you very much, Governor. I appreciate your being here.

The next witness is the Honorable David Packard, Chairman of Hewlett-Packard, former Deputy Secretary of Defense, my boss for 3 years in the Defense Department.

Mr. Packard, we welcome you here and look forward to your testimony.

Before you start off, I would like to read from an article in the Times yesterday, which really is one of the reasons that we are holding these hearings:

WASHINGTON.—A panel of computer experts warned today there is little likelihood under current conditions that the United States would lead the world in developing and using the new supercomputers they said would be crucial for national defense, economic growth, and advances in science. The panel said the United States has thus far been the leader in supercomputer technology and in the use of supercomputers in science, but it warned that American leadership was being seriously undermined by a failure to make existing supercomputers widely available to scientists and by a slowdown in efforts to develop even more powerful computers.

The article continues—

Alarming evidence that the Japanese were moving into world leadership in the design of the powerful computers, with the result that U.S. dominance in the supercomputer market may be a thing of the past.

They also noted Britain, West Germany, France and Japan had all begun vigorous programs to make such computers widely available.

These aggressive foreign national initiatives provide a striking contrast in the current state of planning in the United States.

So it isn't just computers we're worried about, but all of this—jobs for the future.

Mr. Packard, you have been deeply involved and extremely successful in keeping a company that is 40 years old right out in the forefront.

Mr. PACKARD. A little older than that.

Senator CHAFEE. A little older than that? Well, 45 years old. But in any event you have managed to continue to be successful. I see no hardening of the arteries.

We look forward to hearing your testimony on what we, as a Government, can do to be helpful.

STATEMENT OF DAVID PACKARD, CHAIRMAN, HEWLETT-PACKARD COMPANY, PALO ALTO, CALIF.

Mr. PACKARD. Mr. Chairman, I am very pleased to have a chance to be here, and I want to commend you for holding these hearings, because I think this is a very important and a very timely subject for people here in Washington to be talking about as well as people across the country.

I have provided a statement for you which is really more in the form of an outline, and with your permission I would like to go through this and add some points on the various things that I have included in the statement.

I point out, in the first place, that the U.S. leadership in high technology since the war has been determined by two factors. One of them is that we've had a very effective basic research program in this country, and, second, that we have had a very good ability to convert this basic research into new products.

Now, if you look at it in a little more detail you will find, particularly in electronics, and of course that's where my experience has been, that World War II gave the United States a tremendous impetus in the field of electronics. After the war the two countries that had been fairly high in technology, Japan and Germany, were prohibited from doing research in microwaves and in other aspects of electronics—this was also true in aircraft—and so we had a rather special position in the two decades after World War II that enabled our country to build up this very important lead in the high technology industry.

I don't think it's realistic to expect that it's possible to go back to that position of leadership, because these countries now do not have the prohibitions on research and development that they had in the late 1940's, and they indeed have some capability.

So I think what we are looking at is how we are going to maintain a position of leadership, but it will not be the decisive kind of leadership we had up until the early 1960's.

Now, there has been a good deal of concern in the last several years, and I think this has come about because we have been slipping in both of these two areas: No. 1, in our ability to maintain adequate basic research, the new contributions to basic and applied science. There are a number of indicators that show this is happening. The relative number of patents issued in the United States has been declining, as has been pointed out already, and I want to talk about this some more. The relative number of scientists and engineers graduating from our universities here in the United States is declining.

This matter of university graduates declining is a particularly serious problem, because if this is not quickly reversed it will assure further slippage in the U.S. high technology industry in the future.

Our ability to stay competitive by developing new and better high technology products is also declining. Japan's export growth in high technology products is greater than the growth of the United States', although the United States still has a very significant lead overall. In the famous case that has been talked about a good deal of 64K dynamic RAMS, Japan has about 80 percent of the worldwide market and 70 percent of the U.S. market.

Senator CHAFEE. How quickly did they get that? We are now in 1983. How much of that market did they have in 1973?

Mr. PACKARD. Well, in the first place, there were no 64K RAMS in 1973, so you can't really make that kind of a comparison.

I think this particular lead they got in these large-scale integrated circuit components came about partly because our U.S. industry did not do a very good job.

Our company uses these components in our products, and we prefer to buy American components, for obvious reasons. But in the midseventies we found that the quality of the U.S. products was not as good as the quality of the Japanese products, and regardless of the price we have to put first emphasis on quality and we began to buy Japanese products.

That happened with a number of other users, and this enabled the Japanese to rather quickly build up a position in these particular items.

But I want to go on to say that I don't look on this as a permanent indicator of the situation, because in our own company's recent evaluation we have found that there are now American companies that are as competitive in quality as Japanese companies, and some Japanese companies are not very good. So I think this imbalance that occurred along in the midseventies that resulted in this particular case may have been somewhat of an isolated case, and I think the situation has improved to some extent. But, nevertheless, it indicates that the Japanese are doing a very good job.

Now, I think you know that this is a dynamic growth industry, and I won't talk much about the importance of it. You know that it has grown rapidly, produced more new jobs over the last few years than many other industries in our country, that it is very important for our national defense effort to stay ahead in high technology, that this is one area where we have a positive balance of international trade.

So it is a very important industry, and therefore I think it deserves a great deal of attention. I think it also deserves some action now. And I think, as I've said here, the time to act is now, and I think we can and should do something.

Now, I want to say that there is no simple answer to this problem. I think it has to be looked at in all of its facets, and I am going to try to provide an outline for you of all of the aspects that need to be considered. These are interrelated to some extent, and action, even perfect action, on one of these areas alone will not solve the problem.

I don't think enough emphasis has been made on how complex this high technology industry is. It includes electronics as well as microelectronics, it includes computers, which of course are electronic in their character, robots, telecommunications, aerospace, biotechnology, new materials. And I think another aspect of this high technology business is that high technology has an impact on some of the older and long-established what might be called low technology industries.

Automobiles are now using integrated circuits and some other high technology. Machine tools are critically involved in high technology because of the use of computer controls machine tools. And even in such a mundane field as ship propulsion, the fuel efficiency of diesel engines is a critical factor in determining whose ships are going to be best in the future.

So I think it's important to keep in mind that this is not simply an isolated industry, although the isolated part of the industry is important, but that our leadership in this industry will help the other industries maintain a better position as well as the high technology industry.

Senator CHAFEE. I suppose the new materials affect the automobiles, too.

Mr. PACKARD. Yes.

Well, again, I don't think this is a matter which can be solved by the Federal Government, by the State government, or by any other of the institutions in our society alone; I think this is a problem where we have to work together. And I hope that this will provide an opportunity for the U.S. high technology industry to establish a

better working relationship with the Federal Government, with the State governments, and with the universities, because I think this kind of cooperation in working together will be extremely important in whether or not we are going to be able to solve this problem.

On page 3, I outline the areas where action is needed. They include education, research, capital formation, international trade and foreign exchange, Federal tax policies—and I should include other Federal policies, including regulation—and business effectiveness.

I want to talk a little bit about each of these areas, and I want to point out where they interact. I don't propose to be able to offer you all of the solutions, but I hope that this outline will give you some indication of the things that need attention, and help in what you are attempting to do here.

On page 4, I make a point that I don't think a large new infusion of Federal funds is necessary to solve this problem. I don't think throwing more money at the problem is going to help. I think we can do a better job of managing the programs, managing what the Federal Government does, what the universities do, and what we do working together. We may need some modest increase of funding here and there, but I don't think this is a major financial problem.

Now, education is probably the most important aspect of this because, as I've already said, if we do not solve the educational problem we have in this country the situation is going to get worse rather than better in the future.

I think the most important place where the Federal Government can help is at the university level. There are two problems in our schools of engineering around the country. One of them is that they have not been able to attract and keep high quality professors and faculty people, and indeed there is a shortage of well over 1,000 faculty positions unfilled at this time. Some people think it's maybe even twice that.

The second thing is that our engineering schools have relatively obsolete equipment in terms of today's technology. They have simply not been able to keep up and maintain the quality of their laboratory equipment, and this has a significant impact both on their ability to do research and on their ability to teach the young students who will be our scientists and engineers of the future.

I want to emphasize that the professors and the graduate students do important research in these laboratories, in these university laboratories, and it is often very important basic research that is relevant to work done at the large federally supported laboratories, it is relevant to the technology needed for our national security and it is really the basic source of technology on which our high technology industry has been built.

In electronics, for example, over the years there have been only a few companies that have contributed very much to the basic research—Bell Laboratories is the most important. A great deal of this research on which our industry has been built has come out of the university laboratories, and these include Stanford, of course, MIT, CalTech. And really all of the major universities' research

laboratories that are working in these particular fields are important.

This is true not only in electronics. I think you realize that this new field of biological engineering, or biotechnology, whatever it is, again was spawned in the university.

So our universities are a very critical element in establishing the basic technology on which we are going to be able to build in the future.

Senator CHAFEE. I know that you have been close to the universities, particularly Stanford. Do you feel that the Government cuts have been in this area of basic research? Have you seen the effect of government regulations? I know there is some rule about the apportionment of overhead to salaries, and so forth. What should we do?

Mr. PACKARD. Mr. Chairman, I am going to say something about that. Perhaps I will answer your question here in what I'm going to say. If not, let's come back to it and I'll try to answer it.

The first thing that I think should be done is a small, and I should add additional, percentage of the Federal Government's multi-million dollar expenditure on research and development should be diverted to university research, where it would help attract and keep good professors and provide for the modernization of our university laboratories.

I think we could do this and it would result in better research, and it could be done at about the present level of funds that we are allocating to our large Federal laboratories.

Now, some of this is already being done. The Office of Naval Research I think has a good program. They award contracts to universities, and I understand they recently included funds to provide for the universities to buy new equipment.

I think that program is a good one. The National Science Foundation has some good programs, and the Federal laboratories have some good programs in cooperation with the universities.

But what happens in the Federal laboratories goes about this way—and we are spending \$5 or \$6 billion altogether in these programs: There has been pressure on them, and as the pressure comes about they try to keep the money they have available for their in-house work, which is quite logical.

I think some stipulations should be made to encourage and maybe even direct our Federal laboratories to allocate a little more money, of their money that they are getting for their various research programs, to university research. I think they will get more mileage for their money if it's spent that way than they will in doing some of these things themselves; they will help in the generation of scientists and engineers for the future; and they can help in the upgrading of equipment. This is one specific action that should be encouraged.

I have had an experience this last year, the opportunity to visit a number of these Federal laboratories and I feel very strongly about this because I have seen a number of cases where I think this particular action could be undertaken with some very positive results.

This will require some action by the administration, and it will require some support of the Congress.

One of the things I would like to get on the record here is that sometimes the Congress has gotten too involved in this. There has been an awful lot of micromanagement programs directed by various committees of the Congress which really are not productive. We ought to let the laboratory directors, who really are the people who know how to run a good laboratory, have a little more freedom in doing this. And I think if they had more freedom, they would help the universities build up. That's a rather special problem, and I can provide more information for you, if you would like to have it.

Private industry can help in the situation also. I think probably private industry can be more helpful at the lower educational levels. Advanced technology companies are already doing this. Many are helping the local schools in their own communities with their math and science programs.

I think tax policies can be used to encourage companies to give much needed equipment to the schools. This has already been done, and whether it needs to be expanded a great deal or not, I don't know. It is one thing that can be done, and our company has substantially increased its contribution to schools and universities.

While I'm on this point, I don't think we should look at this in terms of computers only. I think it must include all of the other types of scientific equipment that are necessary for a good educational program. In fact, if we divert too much of this effort to computers, I think we are going to do our schools a disservice.

Computers are important. They are a very important part of our business; but I think the so-called Apple bill that was considered by the Congress probably went a little further than it should have, and I'm glad you didn't go ahead with that. I think you need to think that problem through a little bit more before a decision is made.

Senator CHAFEE. Well, don't give us too much credit, because this committee reported it out favorably. But I think that's a good point.

Mr. PACKARD. I really think you should encourage some of the other groups in the Defense Department to follow the policies that the Office of Naval Research has established. I think those policies are very productive, and they don't require a lot of funds in terms of the total amount of money in the Defense Department, as I'm sure you know.

Now, private companies can help, and they are helping, in making grants to universities and doing those things which will help the universities attract and retain people, to provide support for graduate students who will be the future professors of science and engineering, and also to provide equipment.

Just as an example, our company has established a policy where we are going to make some loans to graduate students, half of which will be a grant, really, and half of which will be a loan. If the students, after getting their Ph. D., go on and teach for at least 3 years in a university this loan will be forgiven. So we are trying to provide not only the means for these young people to get a better education but some incentives for them to continue to commit part of their professional career to teaching at these universities. We are going to encourage the rest of the industry to es-

establish programs like this, and I think we are going to get some sympathetic support.

So this, again, is a problem on which I don't think the Federal Government has or should take the final and only responsibility; I think this is a case where a joint effort can be helpful. And I think your committee should work very closely with industry in looking at the ways that tax policies and tax incentives could encourage these kinds of positive activities by companies. I think that it is not only the money but the fact that some of our industry scientists and engineers will work more closely with the university professors, and vice versa, the same is true of our Federal laboratories. I think this cooperative interaction is a positive element, over and above whatever financial aspects there are to the problem.

Senator CHAFEE. I think that's a good point. It comes up so often; we do things not quite realizing the effects. For instance, the Immigration bill that we passed—fortunately we were alerted by the universities that there was a requirement in there that all foreign students had to return to their own countries. Apparently that had a devastating effect on computer teachers in our universities, because many of these young Ph. D.'s were foreign and would remain as instructors. Fortunately the universities let us know, and we were able to straighten that out.

Mr. PACKARD. Well, I think that is a very serious problem, and I think if we could find some way to encourage our own citizens to go on and take the advanced work and undertake to do the teaching and research in the universities, and let the foreign students go back to their countries, it would help the countries and I think it would help the whole world economy. But we are in a position now that it will have to be done over a period of time, and to send these young people home immediately I don't think would be the right course to take now. But I do think it is important, and I hope you will continue to work on it.

The next point I want to talk about is research. The first thing I want to emphasize is that the total figure that we see as expenditures for research and development in the country—I think it is \$43-some billion in the budget under consideration—is not really a very good indicator in evaluating how much federally supported research and development is helpful to the U.S. high technology industry, because most of this \$43 billion in Federal funds is spent developing new military weapons, on high-energy physics, the Space Shuttle, and nuclear energy doing breeders and fusion and so forth.

Now, there is some fallout from these programs, including the military programs. If you go back and look at aerospace, our jet transports were a direct fallout from the development of our jet bombers a few years ago. But I don't think the fallout is as much as is sometimes suggested. We shouldn't overlook it, but we shouldn't consider that to be the major aspect of these big research programs.

Now, as I have already pointed out, I think there is a real opportunity to use the expenditures the Federal Government is making to these big laboratories on these big programs in a more effective way. I think this research can be more supportive of the high technology industry in two ways:

First, I think the technology transfer from these laboratories could be made more effective at no increase in cost. Here again, I have had a chance to visit some of these laboratories. I found some cases where there is good communication with industry, but I found many cases where industry is just not aware of what is going on in these Federal laboratories, and I found some cases where my own company didn't know what was going on in the Federal laboratories in work that could be helpful to the company.

I think some improvement could be achieved by working with the laboratory administrations and with the various agencies involved.

Whether you should have special incentives to encourage laboratories to work on technology transfer is questionable. I think it is most effective when a personal relationship can be established between the people working in the same fields in the laboratory and in the university or industry. Conferences are helpful, various meetings are helpful, but I'm not sure that a director of technology transfer at these laboratories is going to contribute very much.

So I think this is a problem that needs some thoughtful consideration. And again, it's one that doesn't require any particular increase in funding at the laboratories.

Second, I think much of this Federal research could be more effectively directed. I am going to talk a little bit more about that, but I've already commented that more of it could be directed to universities, and I think this is a very small percentage, probably less than 1 percent additional funding, that could be diverted to the universities which would have a very large payoff.

One of the areas where I think effective direction could be specifically useful to a high technology industry is in the field of materials. If you look at every discipline in high technology, we are limited in what we can do by our knowledge of materials. This is true in electronics, where we have all these materials involved in these large-scale integrated circuits and in other aspects of electronics; it is true in aircraft, where the performance of jet engines is limited by the materials—the air foils, and so forth—and right on across the board.

There is a great deal of basic research on materials being done in the large Federal laboratories. Some of this requires very sophisticated equipment, expensive equipment, much of which is already in place in these Federal laboratories. And much of this kind of research is beyond the ability of industry to do itself.

This program is not very well coordinated. It is piecemeal across the country. And I think here a coordinated national effort on advanced materials research would make a very important contribution to our ability to stay ahead in this field.

Here again, I don't think this is an area that requires more money; it requires better management of the things we are already doing in the Federal laboratories. A better understanding, I think, here in the Congress about this problem will be necessary because you will have something to say about the extent to which this might be done.

I think there is a great deal of sympathy among certain people in the Federal laboratories for better researches on materials and I

think industry would be very interested in participating in a cooperative program.

So here, again, I think this is something that could be done, that would be very effective, that is not going to cost a lot of money. And I think the things you do here in your committee might be helpful along the line in encouraging this sort of cooperation.

Senator CHAFEE. In which Department would this best be located? I suppose the Department of Energy is deep into these Federal laboratories. The Department of Defense is.

Mr. PACKARD. Well, yes. I can tell you a little bit about that. There are a great many of these Federal laboratories that have a very precise mission. Some of them are working on weapons; some of them are working on special kinds of high-energy physics, and so forth. But there are two or three of the laboratories that have completed their original mission that are not working on a very good new mission. One of them is the Lawrence Laboratory at Berkeley, and there the new director is very much interested in building that laboratory up to a lead laboratory for materials.

At Argonne there are some very fine people and a very fractionated program, and there is some good capability.

There is some good capability at a number of the other laboratories.

I would not recommend at this time which laboratory might be chosen or exactly how this might be done, because I think this requires the consideration of a number of people; but there are several laboratories who would like to do this. I think there is general agreement that it would be a useful thing to do, and I would simply like to have you keep that in mind in respect to the things you consider here in your committee.

Tax policy is, of course, a factor that is very important in all of this, and I think some of the things that have been done already have been very constructive—the lowering of the capital gains tax—and I think good progress has been made.

I think some further things need to be done, but I don't see this as a place where very significant increases and incentives ought to be considered. I think maybe if you get these incentives too high you won't get people who are working on these problems really doing what they ought to do.

So I would recommend a moderate position on this. And I've already indicated in the case of this Apple computer I think that's a case where you are going too far.

I think that the tax credits that have been made available for increases in research and development are productive. I think they are going to result in some increases in research and development. They are going to pay for a lot of increases that would have been made anyway, so you are not going to get all of your dollar's worth in this field; but I think in balance it is one that is productive.

I think tax credits for contribution of equipment to universities might be expanded to some extent, and there are some other areas where I think tax policy could be helpful. In particular, I point out a little further along about capital gains and stock options.

One other aspect about the Federal expenditures in research and development—I think we need to look at this very carefully and see whether we have the right priorities.

It is my observation that when we provided Federal support to develop products for the commercial market, this effort has almost always been unsuccessful. We can go back to the nuclear powered ship that was built by the Government a number of years ago; it had absolutely no impact on the commercial shipping industry. And some of the programs that have been supported in alternate energy have encouraged people to look at some new products that are really not viable in the marketplace. So I think supporting the development of commercial products is one case where the Federal Government should take a very careful look.

The other question is whether we have the right balance between our high-energy physics and nuclear research—fusion and fission, and all of these other expensive programs. That would require, I think, a high level group of people with scientific competence, and I would not attempt to give you recommendations specifically on that area except to say I think it is one that does need a little further attention.

Capital formation is a very important problem of this matter we are discussing here, for one very significant reason, that the high technology industry is much more capital intensive today than it was two or three decades ago.

I have often commented about this. When we started our business in 1939 all you needed was a soldering iron and a drill press—about maybe \$50 or \$100 worth of equipment, and today you may need a million-dollar device to even get started. So we have a whole new ballgame here.

This is true not only in electronics; I think it is true all the way across the board. Genetic engineering is a new hopeful forefront of high technology. It is a place where I think the cost of getting new products into production is going to be very high. We don't know how high yet, because none of them have gotten to the point where they are commercially viable, but it is certainly going to be measured in the tens-of-millions of dollars rather than in the millions of dollars.

This means that capital availability is going to be very important. And I think, here, the Government should do what you have already done, provide incentives for the private sector to make these kinds of investments. I think what you have done is constructive, and I don't see that this is a place where the Federal Government should itself provide the capital.

Now, there may be a few exceptions to that, but I think your role would be to primarily look at incentives which would encourage the investments.

As you know, there are already substantial increases in risk capital that are available in this country over the last 2 or 3 years. So what's been done has already been very productive.

Senator CHAFEE. Because of the drop in the capital gains rate?

Mr. PACKARD. Because of the drop in the capital gains rate, essentially.

Senator CHAFEE. Would you suggest we go further?

Mr. PACKARD. Well, I want to talk about that a little bit. I noticed that Governor Brown mentioned that subject. I have a little different view, but not dissimilar. I can mention that now.

I think it would probably be a positive contribution if you could go further. I think it would be a positive contribution if you could go to zero.

Senator WARNER. Did you say go to zero?

Mr. PACKARD. Zero capital gains tax.

Now, one of the problems that I'm sure you appreciate is that an awful lot of the capital gains are made by speculation in the stock market, and you don't really help the situation very much by awarding that kind of gain, let it go by untaxable. You have to tax it.

I think one policy that might be considered would be to have no capital gains on the capital that is actually invested in industry.

Governor Brown proposed this to be for industry below 500 people. I think this is a problem for large industry as well as small industry, and I think it might be a useful consideration to see if there were some way whereby if the capital is actually invested in a productive business, whether it be high technology or not probably wouldn't have to be delineated. This could be, I think, a real incentive for people to put their money into a company where it would be productively used rather than to simply buy the stock on the market.

Senator CHAFEE. I'm not sure I understand the difference. Do you mean an unlisted security would be entitled to this special treatment, but if you invested in a listed security you would be treated differently?

Mr. PACKARD. I think if your investment is made directly to the company, if for example a company is selling a new issue of stock, the purchase of that new issue would be subject to no capital gains. If the person bought it after that stock went on the market, there would be a capital gains tax after it goes on the market.

The security industry won't like my proposal I assure you of that, but I really think it is something you could give some consideration to.

Senator CHAFEE. The difference, I guess, would be in an original investment in truly venture capital, if we can define it.

Mr. PACKARD. Well, I think it should be considered truly venture capital, and there are a lot of venture capital companies that are putting money into all of these new small industries. There is a hell of a risk in these; there is going to be a lot of money lost, and some money made.

I think an incentive for more people to gamble in that area would be very helpful, but my point is, further, I don't think it is only the small new ventures that are important in this business. I think it is important to encourage our larger, established businesses to continue to be able to innovate and stay ahead in technology and they too may need more capital.

So I would say that these investments in new issues, whether it be IBM or a company of 500 employees, ought to be treated the same. But then, the sales that are made to make the market on the stock exchange would not be given as favorable capital gains treatment.

Senator WARNER. Let me explore that a step further. That would be secondary offerings, too, for the larger companies, in that category.

Mr. PACKARD. Yes.

Senator WARNER. Now, what sort of a holding period would you recommend to couple with the zero tax?

Mr. PACKARD. Well, the point is I think there is a rationale for saying that when a person invests money that is actually used by a company to do some of these things, it deserves a little better treatment than when he is just investing in the market and maybe gambling on what the market is going to do next week.

Senator WARNER. I think your philosophy is clear. So you don't have any holding period specifically in mind?

Mr. PACKARD. Well, I think you have to have a holding period. I am not going to try to delineate all the ways of doing that, but I think it is something you ought to put on your agenda and discuss, and maybe get some other views on it.

Senator CHAFEE. Yes; that's a good suggestion. I think it could be worked out.

Mr. PACKARD. Now, international trade and foreign exchange is another important area. I am sure you will hear from others in the hearing on that.

The one thing—really not the only thing I want to say but I think an important thing I want to say—is I don't think we ought to build up a protective environment from foreign trade for this industry or any other industry. I think, after all, free trade benefits all the consumers in our country. I think we need an environment of fair trade; I think we need the same access to the Japanese market that the Japanese have to our market.

One reason I think it would be a very bad thing to build up protective barriers for this industry is it would take the competitive incentive away from the industry, and we would not have as good an industry as we are likely to have if we continue to have some competition. And I think we should concentrate on ways to improve our capability and not talk about building up a barrier behind which we can go ahead and do our own thing without having to be competitive.

That doesn't mean there aren't some things that need to be done. I think that hard negotiation is the only way some of these things are going to be achieved, and the Federal Government is the only one in a position to do this. I think some of the people working in this field already recognize this problem.

I think the foreign exchange matter is also an important factor. I am hard put to decide what you can do about it other than hard negotiation. Perhaps some kind of a better international monetary scheme can be worked out, but it is going to be very hard to do something about it.

Certainly the yen-dollar exchange is not at the right level, as far as I'm concerned, and I think most people who have looked at this would agree with that.

I can't give you any recommendations as to how to solve this problem immediately, but I simply commend it to you as one that is important, and you ought to keep it under consideration.

I have already talked about the capital gains tax, and I want to just say a word or two about stock options.

Stock options are a very important mechanism for a newly established industry to attract and keep scientists and engineers. Usual-

ly they don't have the ability to pay high salaries. They don't have the security to offer what a larger company would, so the stock option is a very important aspect of this problem.

Senator CHAFEE. Is it important in a more mature company such as yours, IBM, or others?

Mr. PACKARD. Well, as a matter of fact, as I point out here, this is a two-edged sword. Stock options help companies like ours keep our people. So it works on both sides of the coin.

The important thing about stock options is this: They should not be taxed when the options are exercised, because this really depreciates their value to a great extent. The gains should be taxed at whatever level is decided, when the stock is sold. And that's a very important aspect. I think that's been under consideration and something was done about it, but there are still a lot of people who want to go back and tax the stock when the option is exercised.

That is an extremely important matter in tax policy for both new companies getting started and for older established companies. So it should not be limited to companies under any particular size; it should be across the board.

I have already commented about capital gains tax, so I will go on now and talk about business effectiveness.

It seems to me that productive innovation and innovative production are the two essential elements of a successful high technology company. These, of course, are primarily the responsibility of management.

But the Federal Government does indeed have a significant impact on the business environment. Excessive reporting and unnecessary paperwork takes management time from useful work.

Cooperation between companies on joint research can be done in Japan, and should be not only allowed but encouraged by the Federal Government here in this country.

Senator CHAFEE. Mr. Packard, yesterday we heard considerable testimony from Mr. Price of Control Data about CDC's joint research with other companies. It seemed to me a very complicated arrangement. However, he was saying exactly what you are saying here. He went further in suggesting there should be changes in our antitrust laws to permit this; although in his company they seem to plunge ahead with an abandon that amazed me. They apparently have all the tracks cleared and aren't worried about the antitrust suits.

Let's assume we could change the antitrust laws to permit greater cooperation. Could you see yourself doing this in your company? And how do you divide up the pie when the results come in?

Mr. PACKARD. Well, as a matter of fact, some companies are doing this. The trouble is, there is a great deal of uncertainty. You don't know for sure whether after you do it somebody is going to come back and decided that you violated some antitrust law, or something. So it is part of the uncertainty of it.

But I think most of us are looking at this as an area of opportunity. We have some joint ventures in limited areas for joint research with some of the Japanese companies, in fact, and I think IBM has a joint program with INTEL. I don't know the details, but this is being done to some extent.

The problem is, there is some uncertainty in it. And I think it would be very desirable to clarify the air here and see if it could be set up so that this could be encouraged.

One of the problems in this whole high technology field is the extent to which we are building up enough new basic knowledge. Not very many companies, as I've said earlier, do very much basic research. The Bell Laboratories was the best in the electronic field; I think IBM does more than anyone else in the computer area. Our company has now reached a size where we can do a certain amount of basic research, and we are doing so.

I think that this is the place where joint efforts might be most productive and would not necessarily involve developing products that are not competitive.

Product development is an important area, too, but I would look on the areas of basic research as a place where probably the most important long-range contributions could be made by these joint efforts.

But this is an area which I think has not been fully explored. There are some things being done, and it would be very helpful if the Federal Government working in cooperation with industry could develop policies here that are clear, so we know what we can do, and I think there are some areas here that could be very productive. I don't think they are going to cost anything in terms of additional revenue or contributions by the Federal Government.

Well, in summary I just want to emphasize what I say in this last paragraph. It would be most encouraging to all of the people engaged in the United States' high technology industry if the adversary relationship between business and the Government could be replaced with a new spirit of cooperation. And I hope the subcommittee will put a high priority on exploring ways we can forge a new partnership among all the parties involved. And in doing so I think that's the most important thing that can be done to assure our continued leadership in this very important field.

[The prepared statement of Hon. David Packard follows:]

STATEMENT BY
THE HONORABLE DAVID PACKARD, CHAIRMAN

Hewlett-Packard Company

Mr. Chairman and Members of the Subcommittee: I appreciate the opportunity to testify before your Subcommittee today on your review of government policies to encourage the emergence and competitiveness of high-growth industries based on new technologies.

United States leadership in high technology since the end of World War II has been determined by two factors. We have been ahead of the rest of the world in a number of areas of new basic science, and we have been ahead of the rest of the world in developing new products and new processes.

There has been growing concern in the last few years that U.S. high technology industry is slipping in the face of worldwide competition. We are indeed slipping in respect to the rest of the world in a number of areas of basic and applied science.

The relative number of patents issued to U.S. scientists and engineers is declining, and the relative number of scientists and engineers graduating from our universities is declining. These are but two indicators of our slippage.

This is a matter of great concern, particularly the decline in university graduates, for if this is not quickly reversed, it will assure further slippage in United States high technology industry in the future.

Our ability to stay competitive by developing and producing better new high technology products is also declining. Japan's export growth of high technology products is greater than the U.S. In the case of 64K dynamic RAMS, an important advanced electronic product, Japan has 80 percent of the worldwide market and 70 percent of the U.S. market.

The high technology industry is a dynamic growth industry. It provides new jobs twice as fast as the U.S. average. It gives our country a substantial balance of trade -- \$10 billion in 1981, if consumer electronics are not included. This industry adds a decisive element of superiority to our military weapons.

The United States cannot afford to let its high technology industry go the way of steel and automobiles. The time to act is now.

There is no one simple answer to the problem. The industry is complex, and what helps electronics may not help genetic engineering. Action by the Federal Government, by business and by other institutions in our country is needed.

Today I am going to discuss a number of broad policy areas, all of which need attention. If strong, positive action can be implemented by the government and the private sector working together in all of these areas, I believe we can create the opportunity for the United States high technology industry to maintain worldwide leadership in the future on a permanent basis.

The areas where action is needed are the following:

1. Education - We must strengthen the educational system at all levels from the primary level to the post-graduate level.
2. Research - We must strengthen our research in all areas, at our universities, at our Federal Laboratories, and in our private companies.
3. Capital Formation - High technology industry is becoming more capital intensive. Adequate capital must be made available at a reasonable cost.
4. International Trade and Foreign Exchange - International trade regulations and foreign exchange relationships have an important role in helping the U.S. high technology industry remain competitive.
5. Federal Tax Policies - There are several areas in which Federal tax policy has a large influence on the health of high technology industry.
6. Business Effectiveness - The way a high technology company is managed has a great deal to do with how competitive it can be in the worldwide market place.

I believe these six broad policy areas encompass most of the problems and most of the opportunities for action to assure future leadership. They are inter-related, and I believe it will require a

new spirit of cooperation between the federal government and the private sector to do what must be done.

I want to make it very clear to this Subcommittee that I do not believe a large new infusion of federal funds is necessary. Just throwing more money at the problem will not solve it. I will point out where a better job of managing programs at the present level of funding can bring about a dramatic improvement:

EDUCATION - Our educational system has deteriorated at all levels over the last decade. The most important place for the Federal Government to help is at the university level. There are now more than 1000 unfilled positions in university engineering schools across the country and many engineering schools have obsolete equipment in their laboratories.

The professors and the graduate students do important research in these laboratories, often important basic research that is relevant to the work done at large, Federally-supported laboratories. This university research is often relevant to the technology needed for our national security.

A very small percentage of the Federal Government's multi-billion dollar expenditure on research and development should be diverted to university research, where it would help attract and keep good professors

and provide for modernization of university laboratories. In doing this, I am sure better research would result in many areas with no increase in funds.

Private industry has a role in helping to improve education. Advanced technology companies can help the local schools in their communities in math and science. Many are already doing so. Tax policies can be used to encourage companies to give much-needed equipment to schools. Private companies also make grants to universities to help attract and retain people, and to support the graduate students who will be the future professors of science and engineering. Use of these practices might be expanded.

These are but a few of the ways both the Federal Government and the private sector can help bring our educational system back to the level of excellence needed for the goal we are discussing here today.

RESEARCH - The figures that one sees for Federal research and development -- DOD, DOE, NASA and others -- are not a good indicator in evaluating how much federally supported R & D is helpful to the United States high technology industry. Most of the \$44 billion in federal R & D funds is spent developing new military weapons, on high energy physics, the space shuttle, and nuclear energy, including breeders and fusion, etc. There is some fallout, but not as much as is often suggested by the Departments managing these programs.

There is, of course, much good research done in these big laboratories and on these big programs. I believe this research could be made to be more supportive of the high technology industry in two ways: First, the technology transfer from these laboratories could be made much more effective at no increase in cost. Second, much of the Federal research could be more effectively directed.

For example, in nearly every area of high technology, materials are a limitation. This is true in electronics, in aeronautics, space, in energy and in most other areas of great future opportunity.

I believe a national program on materials research can be built around the work already going on. One of the Federal Laboratories could serve as the center of coordination. If Federal research, university research and industrial research were to be brought together, I believe we already have everything we need to put the United States permanently at the forefront of research on materials. Management, teamwork and motivation are the only elements lacking.

Tax policy is, again, a factor that could help to bring up the level of corporate research and development, but I would not recommend any significant increase of tax incentives above those already in place.

There is also the very important question of whether we have the right priorities for these billions of dollars the Federal Government

is already spending on R & D. Federal support of product development for commercial products has been almost universally unsuccessful. Genetic engineering is a new field of great promise, and I might justify a much higher priority than it is now receiving in Federal R & D support.

CAPITAL FORMATION - High technology industry requires much more capital than it did a decade or two ago. In the early days of electronics, a few thousand dollars of equipment per employee was sufficient. Today equipment costing over a million dollars for a single item is required to be competitive. In genetic engineering, no one knows yet what it will cost to get a new product into commercial production. It will most likely be tens of millions of dollars for the average product.

The availability and the cost of capital will be a critical determinant whether the United States high technology industry can stay out in front. Tax policy, the capital gains tax and depreciation allowances play a very important role. It is very important that the Federal Government take whatever action it can to encourage private investment in high technology industry.

INTERNATIONAL TRADE AND FOREIGN EXCHANGE - I am sure you will hear from others at this hearing about this area. I want to say only one thing: It is important to avoid protecting this industry from foreign imports.

Free trade benefits all consumers in our country, and that means everyone. We need an environment of fair trade; we must have the same access to the Japanese market as the Japanese have to our market. This is an important area for consideration and action.

FEDERAL TAX POLICIES - I have already noted several areas where Federal tax policies can be helpful. The capital gains tax and stock options have a special role in high technology industry.

A new venture can seldom attract good scientists and engineers without stock options, and an established company has difficulty keeping its good scientists and engineers without stock options. Stock options are worth very little if the capital gain on the stock is taxable when the option is exercised rather than when the stock is sold.

A low capital gains tax is essential for the future health of this industry. No tax on capital gains of capital invested in high technology industry would be most helpful, and I hope this option will be carefully considered.

BUSINESS EFFECTIVENESS - Productive innovation and innovative productivity are essential ingredients of a successful high technology company. These are the responsibility of management.

The Federal Government has a significant impact on the business environment. Excessive regulation, reporting, and unnecessary paperwork take management time from useful work. Cooperation between companies on joint research can be done in Japan, and should be not only allowed, but encouraged, by the Federal Government.

It would be most encouraging to all the people engaged in the United States high technology industry if the adversary relationship between business and government could be replaced with a new spirit of cooperation. I hope this Subcommittee will put a high priority on exploring ways we can forge a new partnership among all the parties involved.

Senator CHAFEE. Mr. Packard, I want to thank you for your very constructive and specific recommendations. All too often we have witnesses give us generalities, which are fine. But what you've done is give us the specifics, particularly in regard to the labs, the cooperation among various companies in R&D, capital formation, and stock options. I think there is a tendency for us to say we will give stock options to the young companies coming on. The point you made is very, very helpful.

I see one of your alumni is here, Mr. Warner.

Senator Warner, do you have any questions for our distinguished witness?

STATEMENT OF SENATOR JOHN W. WARNER, U.S. SENATOR FROM VIRGINIA

Senator WARNER. Well, I would just share with you, Senator Chafee, this is our boss sitting here. It is nice to have you in the catbird's seat for a change, and get us out.

Mr. Packard, you touched on a subject that is of great interest to me, and that's the educational field of engineers.

By pure coincidence or curiosity, there is only one engineer in the United States Senate, and I happen to have that degree. So I'm a loner.

Mr. PACKARD. Well, I would concur that that would be a good thing. We have a very bad imbalance between lawyers and engineers in this country.

Senator WARNER. Well, that was the point I was addressing. I couldn't make a living in engineering, so I took a law degree and made a whopping living for a while. [Laughter.]

Why is it that the young people aren't coming in at the bottom? I mean, you show the disparity at the top, but there is something wrong at the bottom to attract these people.

Now, you and I recall, having both gone through engineering school, it was a lot harder, and you didn't have as much time to spend on other frivolous activities, but what is a measure that could be taken there?

Mr. PACKARD. Senator, I think there are a couple of comments on that point.

At the university level there are more young people going into engineering now than there were a few years ago, partly because there has been a shift in emphasis throughout the country on this whole subject. And that's why the shortage of professors is so important, because there are more people going into the educational system and we don't have the faculty that is going to be able to teach them properly. So that part of it I think is already in the direction of being corrected as far as the students are concerned.

At the beginning levels, the primary schools and the high schools, I think you can kind of oversimplify the problem in this way—and this may not be fair to what everybody has been trying to do.

About 15 years ago we began to orient our entire university system toward social reform instead of toward education. And social reform was a very important objective—I am not attempting to depreciate that at all. But as a result of that the quality of education right across the boards has gone down.

That is indicated by the record of lower scores on these SAT tests over this period; it is indicated out in California recently by the fact that the teachers of science couldn't pass a reasonable test—I looked at some of the questions in that test, and I would think if a teacher couldn't answer those questions he or she shouldn't be able to teach. But that's what we are doing.

Now, I think that problem has been recognized. It was partly brought about by the fact that the universities lowered their entrance standards. Well, in lowering their entrance standards, that automatically signalled to the high schools that they didn't have to teach all these subjects. The University of California, for example, has now raised their entrance standards.

There is a recognition of this problem all across the country, and I think people are doing something about it. I think this will be generally self-correcting over the next few years.

I think it is important that Congress and the administration recognize this problem. There may be some things that can be done which would be helpful, but I think things are already underway.

A good many private foundations recognize this problem. Our own personal foundation has made some grants to some school districts to let the districts see what they can do to improve the quality of education, and other foundations have done the same thing.

So there is a lot of work underway. The problem is serious, but I think the trend has reversed. I think we're on the way back to where we should be.

Senator WARNER. Thank you very much.

Senator CHAFEE. Thank you very much Mr. Packard.

The next witness is Dr. Frank Press, President of the National Academy of Sciences. He has a long career in the science field. I noted that U.S. News & World Report named him the most influ-

ential man in science in 1982. Now, that's quite an accolade, Doctor, and we're glad you're here. Please proceed.

**STATEMENT OF DR. FRANK PRESS, PRESIDENT, NATIONAL
ACADEMY OF SCIENCES, WASHINGTON, D.C.**

Dr. PRESS. Thank you, Mr. Chairman.

From your summary of yesterday's session, and from Governor Brown's remarks and from Mr. Packard's remarks, and my own remarks, I think you are receiving a rather strong consensus about the issues that you have so wisely raised in these hearings.

I have a brief statement, some 10 minutes long. I know you are pressed for time, and I may cut some of it out and make some interpolations, but I won't be very long.

I think you have raised a significant issue facing the United States, and your committee is to be commended for its timeliness and the focus of these hearings.

As you may know, my own organization, the National Research Council, is now completing a major study on this very subject, and we hope to issue the panel's report shortly and come back to you at that time.

I would like to give you some perspectives, and raise some questions which should be addressed if we are to deal with these issues effectively.

One perspective has already been articulated by the subcommittee chairman in his announcement of these hearings: That is the need for the United States to set its own house in order rather than simply blaming our present difficulties largely on the trading practices of other nations. And I concur with your view on that.

A second perspective to which this hearing contributes is that of a growing national awareness of the issue of technological competition and its importance to this Nation's future and its economic well-being. Virtually all involved sectors—industry, academia, labor and the government—now agree that the United States faces present and future difficulties in creating and deploying advanced technologies in global markets.

Indeed, some of our leading technological companies have already taken direct and novel actions to confront the problem. For example, as this subcommittee will hear from other witnesses, and you have already heard it, several companies faced with very high costs of developing the next generation of electronic devices have, with the blessing of the Department of Justice, agreed to pool their research resources by forming the Microelectronics and Computer Technologies Corporation.

A few years ago when I was in government, I recall trying to convene a meeting of the vice presidents for research for the major automobile companies. They refused to come together in a single room without a dispensation from the Department of Justice. And all we were going to talk about was basic research in that industry.

I think we need more of this kind of cooperation, and I hope the Department of Justice will not be an impediment to such initiatives.

Senator CHAFFEE. I suppose their problem is the law they have to enforce. So it may be that there are some constraints on the Department.

Dr. PRESS. As I understand it, the problem was not whether they would enforce the law or not, but, the uncertainty of how they will interpret the law, and the lack of clear guidelines on what is or is not permissible.

Further testimony to the national awakening on our problems in international economic competition is the substantially larger investments of American companies in research and development. Major companies are increasing their investments in R&D to new highs in these past few years at a time of a serious recession. And that's a very encouraging result.

And then there is a shift in management, especially in the senior management of major companies toward more technologically trained chief executive officers. I think this trend is also encouraging.

The growing number and variety of research compacts between universities and industry also illustrate how various sectors of our society are responding to perceived national weaknesses in technological competition.

There are, of course, other forces stimulating university-industry partnerships, notably funding pressures engendered by a virtual stasis in Federal support of basic research.

Whatever the reasons, the benefits of facilitating the exchange and smoothing the often turbulent flow of basic knowledge between academia and industry are potentially enormous and should be encouraged.

We have seen results already in biotechnologies, in novel applications of artificial intelligence, and in the creation of new and more versatile robots. These are examples of projects jointly funded through cooperative arrangements between industry and universities.

You have heard about the draw-down in engineering faculties from your other speakers, and I won't go into that. It's been likened to eating of the seed corn. William Perry's metaphor of shooting the farmer may be a more apt description of what is happening in some of our engineering schools.

The response of the semiconductor research cooperative, the American Electronics Association, in supporting university faculties and graduate students is very encouraging. And Mr. Packard gave you a very good example of what his own company is doing just a few minutes ago, and much more can be done.

Against that background of rising concern and action, I would like to set a framework by posing other questions that need answers if we are to deal with these issues. Most certainly, responses to these questions will help to inform the subcommittee's consideration of financial and other factors in technological competition. These are questions that we are addressing, and we will be answering in our own study that will be completed next month.

The first question relates to clearly identifying the actual nature of technological innovation. How in fact are advanced technologies created and deployed?

Irving Shapiro, DuPont's former Board Chairman, once said that "Technology doesn't come from the tooth fairy." The tone of exasperation in that remark is understandable, for it is extremely difficult to convey the enormous complexities of the process by which advanced technologies become commercial products and processes.

Yet, if private and public actions regarding technological competitiveness are to be fully effective, they must be based upon as informed and practical an understanding of how technological creation and commercialization—the whole innovation process—works. They must be fully aware of the nature and linkages of the several parts of the innovative process as it applies to different industries: research, from basic to applied; development; production and manufacturing technology; distribution and marketing.

And financing the innovative process is an essential part of the whole scheme. Each component of the innovative process is driven by different forces. Strengths and linkages between the various parts tend to wax and wane. Each has a different culture. Without the advice of those having well-grounded experience, it becomes difficult, especially at the Federal level, to understand these differences of these varying cultures. And that ignorance inevitably saps the effectiveness of policies intended to improve the Nation's posture in technological competition.

A second question that should be addressed in your deliberations is the importance of advanced technologies to the Nation. That seems on the surface like a simple question; but it's not. As this subcommittee well knows, many industries claim a special place in the Nation's economy, and rightly so. The question is whether the claims for the future welfare of the Nation's advanced technological capacity are comparable? Or are they unique, and therefore in need of unique attention and policy?

Certainly if we are to design policies that will strengthen the Nation's advanced technological capacity, then we need to articulate clearly the nature and criticality of that capacity to the Nation's future.

In what ways are advanced technologies of strategic and tactical importance to our economy, to its various components such as the service sector or the manufacturing sector, or even our low and middle technology industries as they attempt to modernize? And in what way are they vital to the competitiveness if not the survival of the whole industrial sector, and of course to our national security?

The answers to these fundamental questions—the actual processes by which new technologies are created and deployed, and their relevance to the Nation's future—will in turn provide crisper answers to questions on the efficacy of the various instruments and actions available to the Government.

Where are the weaknesses in our ability to innovate? Are they in the manufacturing and production aspects? I personally believe they are. Do we have to do more in research and development? And, of course, you have been exploring the Government's role.

What about our abilities to market and distribute these new products, which have to be sold on a global scale?

Do we face the problems, the serious problems, in the availability of sufficiently educated and trained personnel? And of course you

have spent a great deal of time on this question and trying to discover the appropriate roles of industry, the Federal, State, and local governments.

It is a matter of significance that Japanese commentators have stated that Japan's economic success is, to a significant degree, due to the early recognition that a good educational system is a prerequisite to technological progress.

What should be the Federal role in supporting basic research and development programs, as, for example, the recently announced intention to increase Federal support of aeronautical research?

This is a controversial issue, and you have heard Mr. Packard and others say that in some areas the Government has a natural role, and in other areas it hasn't had a good record.

I think everybody agrees that the Government role as the major patron in basic research is absolutely essential.

In my own Congressional testimony to other committees I proposed a compact between the Federal Government, industry, and the universities, in which the Federal Government would increase its support of basic research a few percent each year in real growth. Industry would provide a 1-percent growth each year in its funding of basic research in industry. And universities themselves, I am sure, can contribute a few percent by reducing their indirect costs, perhaps with incentives by reduced regulations from the Federal Government which make university research more expensive.

When one looks at the record of university contributions from basic research through the innovative process to new industries, it is enormously impressive. The whole biotechnology area was opened up by university research.

Antibiotics, artificial intelligence, the cures for polio and other diseases, the very basis of digital communication and information theory comes from universities. The whole maser-laser developments were, to a large extent, drawn from university research. And the basis of our computer, the stored-program computer, comes out of academia. Our agricultural success comes out of universities.

So the record is truly an impressive one, and I think the Federal dollar invested in university research is eminently worthwhile.

I agree with Mr. Packard that within this enormous Federal budget of R&D of some \$40 billion, most of which is in development, by shifting from one sector to the other we can do all of these things in basic research that has such an important return on its investment.

Senator CHAFEE. Wouldn't you say that the National Science Foundation's technique of awarding grants to the universities has been, as I've seen it, extraordinarily successful, and done with amazingly little political interference or political considerations? They don't seem to me to be sprayed around, like the U.S. Government does most things. They are directed toward where the results can come from.

Dr. PRESS. I would agree with that. I think their record is excellent, and they've done just what you've said. And I would also add the National Institutes of Health grants program to that category. They also support major basic research in universities.

In fact, it has an excellent record.

Senator CHAFEE. I shouldn't have excluded the NIH.

Dr. PRESS. That's right.

Senator CHAFEE. There must be tremendous pressure for one's State university to be getting its share. Everyone wants the prestige of an NIH grant to come to the University of X.

Dr. PRESS. The agencies do have this great pressure on them, but by and large, studies have shown that their grants go to those institutions where most of the best scientists are in residence.

I would not, however, be opposed to programs that support the best scientists in the country, and as well the best scientists in each region. As we have discovered, successful research carried out regionally and locally leads to new industries being established in those areas, and we shouldn't restrict that opportunity to certain regions of the country.

But there is no question that our first priority is to support the scientific work of the best people with the best records.

Senator CHAFEE. Success, then, breeds success.

Dr. PRESS. That's exactly right.

There was a question raised earlier today by you, Mr. Chairman, about the supercomputer and how successful we will be in this new area. It is an important question as to what the Federal Government-support role should be in this development, through defense research and development, through procurement, and so on.

These are among the promotional mechanisms available to strengthen the Nation's international competitive role in this area of technological growth.

And you've mentioned antitrust policies and their interpretation. These statutes which are some 80 years old or so should perhaps be reviewed in the light of today's international economy and the global scale of markets.

There are some dramatic illustrations of the effects of changes in tax policy upon innovation, and these have been mentioned today; for example, venture capital, which virtually disappeared after the 1968 increases in capital gains taxes. Since 1978 when the rates were lowered, we have seen venture capital reappear and it has been boosted even further by the 1982 tax revisions which further lowered the effective rate.

Thanks, in part, to these changes in Federal policy, the U.S. venture capital industry is now robust. Should more be done?

However, while more money has become available for startup companies, the financial environment for the larger, established, and often equally innovative companies remains dour. Indeed, the secular trend has been for U.S. companies to pay at least twice as much for money as Japanese companies. Overall, the U.S. companies may be at a disadvantage vis-a-vis Japanese companies in the availability and cost of long-term capital.

While most Americans would not want to copy the Japanese system of industry-governmental relationships, we should consider whether there are mechanisms within our own traditions that would enhance the competitiveness of U.S. companies?

Obviously, the macroeconomic climate is a powerful determinant, such as the interest rates and the value of the dollar relative to the yen. However, are there unique aspects of investment in new technologies that might be taken into consideration by this Congress

and by the executive branch as they develop tax and other policies? Examples include the more rapid obsolescence of plant, equipment, and products, and the higher rates of earnings reinvestments practiced in the high technology area.

Also, it is generally recognized that in many cases—for example, computers, commercial airplanes, and telecommunications equipment—large-scale economies and therefore profits will be realized only if the products have access to world markets. Do we in our policy formulation pay sufficient attention to the vital necessity of technological companies operating in global markets if they are to survive and prosper?

Senator CHAFEE. Do you have any specifics? Are there impediments to technological companies operating in the global markets now?

Dr. PRESS. I will come to some of these in a little while, but there are some that I might mention at this time.

Other countries allow companies to group together in consortia and to develop and deliver packages like entire telecommunications systems to another country. While we are moving slowly in that direction, in the past we haven't given our domestic industry sufficient flexibility to do more of this.

And I think that in our negotiations on the terms of trade policies with other countries, we should take tough stances when it comes to distortions of the free market.

I should add a few words about the capacity of the Federal Government to act effectively, expeditiously, and coherently in maintaining the Nation's future strength in advanced technologies.

Mr. Chairman, in announcing these hearings, you quite appropriately cited the multiple elements which en bloc determine successful technological competition. There are some 12 Government agencies which, in their separate policies, influence our ability to compete in the high technology sector. I believe that in this administration and in former administrations there has never been a coordination mechanism for these companies to assess their separate actions to see whether or not they are complementary or not, and to create a single national policy governing this very important area.

As a related matter, does the Government now have the competence to understand the forces and processes operating on technological innovation? Does it have sufficient personnel that understands not only how a new technology is created but how its principles are embodied in globally competitive products and processes?

Does it have an analytical capability that is truly experiential, growing out of concrete and practical tutoring on how innovation is accomplished?

Although much can be done to enhance our industries' competitive standing using coordinated policies within our traditions, there are practices of other countries, such as targeting of specific sectors and predatory pricing, that can damage the U.S. advanced technology capacity.

It seems to me that our Government must learn to practice promptly and react on a time scale short enough to prevent irreversible damage. And this is not a call for protectionism, but a call

for a recognition of distortions to the free market that can damage our technological capacity.

I realize that this and other questions I have posed in my statement are at once simple and difficult. Yes, as I said earlier, we need to resolve them if we are to emplace policies and practices that will help position the United States for continuing strength in this important new area.

Mr. Chairman, we are now engaged in a competitive and borderless technological race. It is a new reality, and this Nation is slowly coming to realize its implications. We must find domestic and international solutions that will allow all nations to benefit from the fruits of science and technology.

I have indicated that my own institution is engaged in a major study in this area, with a panel drawn from industry, academia, government, and other knowledgeable groups. And we will make this report available to you in the month ahead.

Thank you very much.

[The prepared statement of Frank Press follows:]

STATEMENT

by

FRANK PRESS

PRESIDENT, NATIONAL ACADEMY OF SCIENCES

Thank you, Mr. Chairman, for this opportunity to appear before the Subcommittee. I won't belabor the importance of the issue that prompted these hearings: the competitiveness in world markets of our advanced technology industries. That issue is certainly a significant one facing the United States, and the Subcommittee is to be commended for the timeliness and focus of these hearings.

As you may know, a National Research Council panel is now completing a study of advanced technologies and international competition. We hope to issue the panel's report shortly, and believe that it will contribute to the expanding national dialogue on the global technological competitiveness of the United States.

If I may, I would in my brief statement like to offer some perspectives on the issue and then to suggest some questions which should be addressed if we are to deal with it effectively. In our study we will be addressing some of these questions.

One perspective has already been articulated by the Subcommittee Chairman, in his announcement of these hearings. This is the need for the United States to see to its own house, rather than simply blaming our present difficulties largely on the trading practices of other nations. I concur with that view.

A second perspective, to which this hearing contributes, is that of growing national awareness of the issue of technological competition and its importance to the nation's future, most especially

its economic well being. Virtually all involved sectors--industry, academia, labor and the government--now agree that the United States faces present and future difficulties in creating and deploying advanced technologies in global markets.

Indeed, some of our leading technological companies have already taken direct and novel actions to confront the problem. For example, as this Subcommittee will, I believe, hear from other witnesses, several companies faced with the very high costs of developing the next electronic generation have, with the blessing of the Justice Department, agreed to pool their research efforts by forming the Microelectronics and Computer Technology Corporation. A for-profit vendor of 15 companies with a projected budget of 50 to 100 million dollars, the new corporation will conduct and support research on computer-aided designs, integrated circuits, software, and advanced computer architectures. At this point, its effectiveness remains uncertain; but it is a significant and imaginative step, and should be given a lengthy test.

Further testimony to the national awakening to our problems in international competition for advanced technologies is the substantially larger investments by American companies in research and development. A survey by the National Science Foundation of some 60 companies projected a three-percent real increase in r&d spending each year from 1981 to 1983. It is also notable that the demography of management seems to be changing. For example, according to a recent

survey by CHEMICAL AND ENGINEERING NEWS, 90 percent of the chief executive officers named in the chemical process industry since 1980 have technical degrees. About a quarter have doctorates. That contrasts sharply with the pattern of the 1970s when financial and managerial training dominated. As this Subcommittee is aware, some students of technological innovation have suggested that in the past decade there was an overshift in some firms to "management by the numbers," to quantitative techniques of modern financial analysis, with a resultant loss in some corporations and industries of their historical willingness to take technological risks.

The growing number and variety of research compacts between universities and industry also illustrate how various sectors of our society are responding to perceived national weaknesses in technological competition. There are, of course, other forces stimulating university-industry partnerships, notably funding pressures engendered by a virtual stasis in federal support of basic research, discounting support for defense and space-related research. Whatever the reasons, the benefits of facilitating the exchange and smoothing the often turbulent flow of basic knowledge between academia and industry are potentially enormous.

We are, indeed, already seeing results in biotechnologies, in novel applications of artificial intelligence work, and in creating new, more versatile languages for manipulating robots. By and large, the academic-corporate arrangements put in place are well-thought out and mutually beneficial.

We should also recognize that industry has moved beyond just research arrangements in confronting some of the problems bedeviling the universities. One such problem is the drawdown of engineering faculties because of higher industrial salaries. That's been likened to "eating the seed corn." William Perry's metaphor of "shooting the farmer" may be more apt. Responses to these more general problems include those of the Semiconductor Research Cooperative and the American Electronics Association, with these organizations assisting universities both by research support and by subventions of professorial salaries. Much more is being done than I can list in this brief statement.

Finally, several federal studies are illuminating the issues underlying this national awakening, notably recent reports, some as yet not released, of the Cabinet Council on Commerce and Trade assessing U.S. competitiveness in high-technology industries, the Central Intelligence Agency, the Department of Commerce, and the National Science Foundation.

Against that background of rising concern and action, I would like to pose other questions that need answers if we are to deal with the issue well. Most certainly, responses to these questions will help to inform the Subcommittee's consideration of financial and other factors in technological competition.

The first question relates to clearly identifying the actual nature of technological innovation. How in fact are advanced technologies created and deployed? Irving Shapiro, DuPont's Board

Chairman, once said that "technology doesn't come from the tooth fairy." The tone of exasperation in that remark is understandable, for it is extremely difficult to convey the enormous complexities of the process by which advanced technologies become commercial products and processes.

Yet, if private and public actions regarding technological competitiveness are to be fully effective, they must be based upon an informed and practical understanding of how technological creation and commercialization -- innovation -- works. They must be fully aware of the nature and linkages of the several parts of the innovative process as it applies to different industries: research, from basic to applied; development; production and manufacturing technology; distribution and marketing. Each component of the innovative process is riven by different forces. Each responds to different signals. The strengths of the linkages between the various parts tend to wax and wane. Each has a different culture. Without the advice of those having well-grounded experience, it becomes difficult, especially at the federal level, to understand these differences, these varying cultures. And that ignorance inevitably saps the effectiveness of policies intended to improve the nation's posture in technological competition.

A second question that should be addressed in your deliberations is the importance of advanced technologies to the nation. That seems on the surface a simple question; but it is not. As this Subcommittee well knows, many industries claim a special place in the nation's

economy; and rightly so. The question is whether the claims for the future welfare of the nation's advanced technological capacity are comparable? Or are they unique? And therefore in need of unique attention and policy.

Certainly, if we are to design policies that will strengthen the nation's advanced technological capacity, then we need to articulate clearly the nature and criticality of that capacity to the nation's future. In what ways are advanced technologies of strategic and tactical importance to our economy? To its various components, such as the service sector or the manufacturing sector? In what ways are they vital to the competitiveness if not survival of different industries? To our national security?

Answers to these fundamental questions--the actual processes by which new technologies are created and deployed and their relevance to the nation's future--will in turn provide crisper answers to questions on the efficacy of the various instruments and actions available to the government.

For example, where are the weaknesses in our ability to produce new technologies? If they are, as some believe, in the robustness of our manufacturing and production technologies, then what should management do? What should the government do? If there are weaknesses in our abilities to market and distribute new technological products and processes, than again what corrective steps should management take? What is the optimal federal role?

Do we face problems in the availability of sufficiently educated and trained personnel--in the general workforce or in production technologists or research scientists and engineers? What is the federal role in assuring the future adequacy of our human resources? And what are the comparable roles of state governments and local jurisdictions? Japanese commentators have stated that Japan's economic success is to a significant degree due to the early recognition that a good educational system is a prerequisite to technological progress. As a corollary, should the federal government move to encourage the growth of the university-industrial relationships I spoke of earlier? Should, as one illustration, independent research and development funds--IR&D funds--be made more readily available to universities, as Richard Delauer has suggested?

Further, what should be the federal role in supporting broadly-based research and development programs, as, for example, the recently-announced intention of increasing federal support of aeronautical research? It is a controversial issue, and certainly the line between broadly-based support and the support of particular technologies is hard to draw. Nevertheless, are new technologies becoming so demanding in their research and development costs that they lie beyond the capacities of the private sectors to compete with foreign companies who are directly or indirectly supported through tax credits and other incentives by their governments? For example, can U.S. companies compete with the huge and well-supported program of the Japanese toward creating the next generation of electronic components

and devices, a field in which this nation has to date led? What are the consequences if we lose that leadership?

Should the federal government assert a role, for example by defense R and D, or procurement in the future strength of our supercomputer capacity? If not direct, should it take some indirect steps; for example, in assuring that its antitrust policies encourage rather than impede the cooperative research efforts of U.S. companies.

More generally, what of the spectrum of fiscal instruments available to the government? Which instruments are most effective? Which of dubious value? Which are the most vital to enhancing technological capacity?

We've already had some dramatic illustrations of the effects of changes in tax policy on innovative vigor. Venture capital virtually disappeared after the 1968 increases in capital gains taxes; it reappeared in 1978, when the rates were lowered and has been boosted even further by the 1982 tax revisions, which further lowered the effective rate. Thanks in part to these changes in federal policy, the U.S. venture capital industry is now robust. Should more be done?

However, while more money has been available for start-up companies, the financial environment for the larger, established, and often equally-innovative companies remains dour; indeed, the secular trend has been for U.S. companies to pay at least twice as much for money as Japanese companies. Overall, the U.S. companies may be at a disadvantage vis-a-vis Japanese companies in the availability and cost of long-term capital.

While most Americans would not want to copy the Japanese system of industry-governmental relationships, are there mechanisms within our own traditions that would enhance the competitiveness of U. S. companies? Obviously, the macroeconomic climate is a powerful determinant, such as the value of the dollar relative to the yen. However, are there unique aspects of investment in new technologies that might be considered by this Congress and by the Executive Branch, such as the more rapid obsolescence of plant and equipment or the higher rates of earnings reinvestments. Also, it is generally recognized that in many cases--for example, computers, commercial airplanes, and telecommunications equipment--large-scale economies, and therefore profits, will be realized only if the products have access to world markets. Do we in our policy formulation pay sufficient attention of the utter necessity of technological companies operating in global markets if they are to survive and prosper?

In concluding my statement I must add a final issue: the capacity of the federal government to act effectively, expeditiously, and coherently in maintaining the nation's future strength in advanced technologies. The Chairman, in announcing these hearings, quite rightly cited the multiple elements which en bloc determine successful technological competition. I've briefly indicated some additional elements. However, given the enormous complexity of our technological enterprise, no single policy will be decisive. It is the collective results that matter. Yet, we tend to be ad hoc in the manner in which

we formulate, legislate, and apply federal policies relating to technological competition.

In many cases, there are predictable disappointments; policies that are ineffective, discontinuous, or contradictory. The question then is whether new mechanisms should be emplaced that will be truly effective in providing a framework for judging the collective effects of our policies? As a related matter, does the government now have the necessary competence to understand the forces and processes operating on technological innovation? Does it have sufficient personnel that understands not only how a new technology is created, but how its principles are embodied in globally-competitive products and processes? Does it have an analytical capability that is truly experiential, growing out of concrete and practical tutoring in the actualities of technological innovation?

Although much can be done to enhance our industries' competitive standing using coordinated policies within our traditions, there are practices of other countries such as targeting specific sectors and predatory pricing that can damage the U.S. advanced technology capacity. It seems to me that our government must learn to recognize these practices promptly and react on a time scale short enough to prevent irreversible damage.

I realize that this and the other questions I have posed in my statement are at once simple and difficult. Yet, as I said earlier, we need to resolve them if we are to emplace policies and practices that will help position the United States for continuing strength in technological creation and deployment.

Mr. Chairman, we are now engaged in a competitive and borderless technological race. It is a new reality, and this nation is slowly coming to realize its implications. We must find domestic and international solutions that will allow all nations to benefit from the fruits of science and technology. As I indicated earlier in my statement, we in the National Research Council have established a distinguished panel, chaired by Howard Johnson of MIT, to consider these implications and the many of the other issues that are the focus of these hearings. I anticipate that the Panel's report will be available in late Winter, and we will be pleased at that time to present the results of the Panel's work for the consideration of the Subcommittee.

This concludes my formal statement. I would be most glad to respond to any questions which you may have.

Senator CHAFEE. Dr. Press, thank you very much. When is your panel going to report?

Dr. PRESS. By the end of February.

Senator CHAFEE. By the end of February. Well, we certainly will ask you to come back at that time and give us a summary of the report.

As I understand it, the report is going to deal with the very subject of these hearings. Am I correct?

Dr. PRESS. It almost completely parallels these hearings, yes.

Senator CHAFEE. I'm sure it will be extremely helpful. Will you get into capital gains taxes?

Dr. PRESS. Yes, the repeat will discuss tax policy, antitrust policy, regulatory policy, and the policies of every agency in government that contributes to our national posture in this area.

Senator CHAFEE. You talked about the interchange of this basic knowledge between the academics and industry. You heard Mr. Packard's testimony on the labs. Do you agree with what he had to say?

Dr. PRESS. I certainly do. I think that the national laboratories are an important national institution, and to the extent that they can contribute to our economic development through a transfer of information, we should fully exploit this source.

Senator CHAFEE. But do you agree with him that what they are doing is not transferring to the universities?

Dr. PRESS. The national laboratories are in a state of transition. Most of them were created originally for different purposes, and they are now trying to participate and be helpful in solving today's problems. Increasingly I believe they will try to meet the goal of distributing more of their information and more of their research results to universities and to industry.

This kind of flow between universities and industry and our national laboratories is absolutely unique for the United States. In no other advanced country does the university contribute so much to industry as in the United States, and we are off on a new initiative in this country to go beyond where we've been before. Every other country in the world admires our research universities and their contributions to industrialization.

Senator CHAFEE. Do the Japanese do their basic research inhouse or through their partnerships between the various companies?

Dr. PRESS. In the past the Japanese have under-invested in basic research, both in their universities and their industry. They now realize that if they are going to maintain their own position competitively in these high technology markets, they must invest much more in basic research, and they are doing so in their universities and by incentives for their industries to do so.

Senator CHAFEE. How about the research park they have set up outside Tokyo?

Dr. PRESS. That's one example of their new approach to investing more in research.

Senator CHAFEE. Well, thank you very much, Doctor. I appreciate your coming here. You have been very helpful.

Dr. PRESS. Thank you.

Senator CHAFEE. We have a real challenge ahead of us.

We will now have a panel of Mr. Roger Wellington, Chairman and Chief Executive Officer of Augat—and a Rhode Islander; Dennis Wisnosky of GCA, and Dr. Sheldon Weinig, President of Materials Research Corporation.

Mr. Wellington, I am glad to see you again.

Mr. WELLINGTON. Thank you, Senator.

Senator CHAFEE. I guess you would call Mr. Wellington's company a medium-sized company. You are in the high-tech business in the New England area. We would appreciate hearing what you have to say.

Mr. WELLINGTON. All right, thank you.

STATEMENT OF ROGER D. WELLINGTON, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, AUGAT, INC., MANSFIELD, MASS.

Mr. WELLINGTON. I think our company is typical of the middle-sized high-growth company. In 1972 we were an early member of the emerging New England electronics industry, with annual sales of \$14 million and 350 employees, with two plants, in Attleboro and Ashby, Massachusetts.

In the ensuing decade, the company's revenues have grown thirteenfold with 26 plants employing 3,000 people in Massachusetts, Rhode Island, New York, New Jersey, Florida, Texas, California, and Switzerland. During that time we have established our own wholly owned marketing subsidiaries in all major industrial markets.

I have the privilege of also being a director of the Bay State Skills Corporation in Massachusetts—this organization has similar objectives to those described by Governor Brown's CWETA in California; also the Massachusetts High Technology Council, which has devoted itself to a better economic climate in Massachusetts, particularly emphasizing the development of the human skills resources.

I have been privileged to be a member of the American Business Conference and served in 1981 and 1982 as the chairman of the New England Council of the American Electronics Association, also being a director of the national organization.

This statement, however, is not offered on the behalf of any of those organizations, but is instead my own conclusions from 31 years of experience in the electrical and the electronics industry. Sixteen of these years were spent totally in international trade, including 9 working in Great Britain, Germany, and Switzerland.

This committee has solicited testimony on how the Federal Government can help industry in creating more and better jobs. You have asked for views on the adequacy of investment funds available to high growth industries. And you are rightfully concerned with the level of research and development expenditures by American business.

My statement will suggest that our economy's lack of growth and weakness in world trade competitiveness has been largely derived from basic tax policies of the Federal Government. I will further suggest that the solutions will not be found in adding more nuances to the current corporate tax structure but rather by fundamentally reexamining the structure itself.

Before doing this, however, let me elaborate on problems that I feel have been caused by current policy, particularly for high growth companies.

First, the tax policy specifically against mid-sized high growth companies. These are the companies that have provided the highest growth rates in jobs. They are also the companies, because of high growth and rapid technological obsolescence, that have the highest capital requirements. These companies have outgrown the venture capital size and are largely in the \$25 million to \$1 billion sales bracket.

The effective tax paid by companies in this size bracket was more than double during the period 1976-80 of that paid by the companies in the Fortune 100 list. At the other end of the scale, small business has been given appropriate tax relief. The precise figures on these studies will be released at a March 9 meeting of the American Business Conference here in Washington.

Studies, which are appendixes to this statement, have concluded that the Accelerated Cost Recovery System offered only tax relief, basically, for long-lived investments such as structures, but actually represented a tax increase to high growth, high technology firms.

Senator CHAFEE. Could you explain how that works?

Mr. WELLINGTON. Yes. If you take relatively high and realistic discount rates, 6 percent and above, and take the types of equipment that our industries must buy and depreciate over 3 to 5 years, realistically, because of technical obsolescence, you will find that the financial analysis attached here shows that the actual tax benefits attributable for property of a useful life of 3 to 5, 7 years, get into the 3- and 5-year areas, the tax benefits were better under the double-declining balance approach. That's actually been supplied by one of the big-eight accountants.

Senator CHAFEE. I see you have the whole thing summarized here.

Mr. WELLINGTON. Yes; it's all summarized, Senator.

Senator CHAFEE. I can understand the concern for those high technology companies faced with equipment obsolescence, although you didn't get a lot out of the 1981 act, I didn't think you were set back. Let's take a look at that chart.

Please proceed.

Mr. WELLINGTON. Interestingly, the Nation does not really have a 46-percent corporate income tax rate, as popularly perceived for the corporations, but rather a variable and constantly changing rate, with the highest effective rate usually applying to those high growth companies to whom this hearing is addressed.

A basic economic research study being prepared by Dr. George Hatsopoulos, Chairman and Chief Executive Officer of the Thermo Electron Corporation in Waltham, has established a dramatically increasing gap between the cost of capital in the United States versus Japan has probably had the most adverse effect on the performance of the U.S. economy in the last decade compared to all other factors. This research will be presented to the same General Membership Meeting of the ABC, and I do commend it to your attention.

The constantly changing tax rates on corporate profits and the lobbying efforts and resulting complications of the code have proven to be disappointing, I believe, at best.

For that reason, this testimony will suggest that the total elimination of the present corporate income tax with the substitution of a consumption-based tax is the solution most likely to produce the results desired by these hearings. The reasons for this are as follows:

Corporate income tax is in fact a disguised consumption tax. It is a cost that is treated as any other cost of production, such as labor and materials, when pricing products and services, to arrive at an after-tax profit sufficient to attract investment flow and provide funds for reinvestment for growth. The tax is passed on to the consumer, in any event. The transfer of these taxes to an undisguised consumption tax would not represent any loss of tax revenue.

The United States is rapidly becoming alone in relying on income tax, either corporate or personal, as the major source of Government revenues.

American industry exports bear U.S. income taxes in their pricing and then are further burdened with turnover equalization taxes, plus duties upon entry into most foreign major markets. Our foreign competitors are totally refunded all turnover tax content in their products and do not receive a compensating tax upon entering the United States. Even when import duties are identical, which they seldom are, American products are more expensive in export, and foreign imports cheaper, through tax policy alone. The original GATT negotiations were structured to cause this result without being recognized by the United States.

DISC legislation was inaugurated as a partial remedy. We have improperly agreed that DISC is unfair under the GATT treaty and are progressively abandoning this vital provision without any enacted replacement. GATT members have demanded DISC repeal, and the only undebatable answer is the substitution of a consumption-based tax for the corporate income tax. Our exports would then be credited with their consumption tax content upon export, and foreign imports would pay an imported equalization tax as is the predominant practice among our major trading competitors.

As we all know, a corporate income tax is double taxation. Dividends are already taxed at full personal income tax rates. The real bearer of the tax on corporate income not allowed to be reinvested is the total U.S. economy.

The American worker bears the cruelest burden, due to this unproductive cost having been superimposed on the cost of all of our products and services, domestically and in international trade.

Is it fair to place the blame so heavily on low productivity or high American labor costs for our international trade deficits? I believe the Congress of the United States should also accept its share of the blame.

The question of the adequacy of research and development expenditures by American industry has been raised for consideration in these hearings. I agree that they are inadequate in many sectors of high technology, particularly those targeted by Japan.

Unfortunately, the solution will not be found in an on-and-off short-term manipulation of the tax code. If we must live with the

present form of corporate income tax, the present targeted research and development tax relief must be strengthened and, most importantly, made permanent.

However, I submit that tax policy—yes, sir?

Senator CHAFEE. You are talking about the tax credit for the 25-percent incremental increase.

Mr. WELLINGTON. Yes; which is due to expire.

Senator CHAFEE. You believe it must be strengthened, and I agree with you. I think we will make it permanent. One of the things we are waiting for is to find out how well it has worked. Are you for it?

Mr. WELLINGTON. Yes, I am.

Senator CHAFEE. What would you do—make it larger?

Mr. WELLINGTON. I would also include a cost in that R&D calculation today not allowable, such as some of the overhead costs associated with it.

Senator CHAFEE. Would you repeat that?

Mr. WELLINGTON. Overhead-types of costs that are not categorized as allowable today.

Senator CHAFEE. Would you increase the tax percentage?

Mr. WELLINGTON. I would not favor increasing the tax percentage under the present system. I would be more in favor of changing the structure.

I will point out why I feel that way. I think that our tax structure should be supportive of high growth without attempting to judge whether this growth will be accelerated by more research and development expenditures, expanded marketing particularly in exports, improved quality, longer product life, greater reliability, or better service.

It is not enough to simply develop the new products. If we are out-marketed in that endeavor, we will not have the exploitation of that development that we wish to have.

One of the earlier witnesses pointed out that the Japanese basic research has not been outstanding; they have done a better job of marketing and developing those products.

Senator CHAFEE. I'll ask you some questions on that later. Please proceed.

Mr. WELLINGTON. In our particular company, permanent removal of corporate income tax would result in almost doubling our current levels of research and development expenditures, and larger increases in marketing expenditures, particularly in our Japanese company, and the ability to price our products more aggressively. Other firms and industries would allocate these increased resources in the way to best enhance their own growth.

In answer to those who would say that tax relief doesn't work because of the disappointing results of the investment incentives of the Economic Recovery Act of 1981, I think we must recall that the emphasis on those incentives was for the installation of new plant and equipment during a period of record high interest rates and already very high existing overcapacity.

In other words, this bad timing is a classic case of the failure of centralized detailed economic planning. I have to observe that it hasn't worked very well for 60 years in the Soviet Union, and I

don't think it should be expected to work 60 years later in the United States.

I would also, relative to the currency relationships, exercise caution with regard to establishing a Breton Woods type of convention. The decade of the 1960's planted the seeds for many of today's problems. We were very high-priced in American exports due to the unnaturally expensive dollar at that time, causing billions of dollars to flow into the installation of plants overseas in order to be able to participate in those markets.

The current short-range interest problems, I suggest, are more derived from the extremely high real interest rate differentials that have existed in the last 2 years, as our inflation rate came down, between our attracting capital, particularly from Japan, to take advantage of those real interest rates.

If our interest rates become competitive on a real basis rather than excessively high, I think the currency problem will take care of itself.

I would like to thank you for the opportunity to present this statement.

[The prepared statement of Roger Wellington follows:]

STATEMENT OF ROGER D. WELLINGTON

Good morning. I am Roger D. Wellington, Chairman of the Board and Chief Executive Officer of Augat Inc., a Massachusetts based manufacturer and designer of a broad range of electromechanical interconnection products, services and precision materials for the electronics industry.

In 1972 Augat was an early member of the emerging New England based electronics industry with annual sales of \$14,000,000, 350 employees, and two plants in Attleboro and Mashpee, Massachusetts. In the ensuing decade, the company's revenues have grown thirteen-fold with 26 plants, employing 3,000 people in Massachusetts, Rhode Island, New York, New Jersey, Florida, Texas, California and Switzerland. During that time, Augat wholly-owned marketing subsidiaries have been established in Great Britain, France, Germany, Sweden, Italy, Switzerland, Canada and Japan.

I am a director of the Bay State Skills Corporation, Massachusetts High Technology Council, a member of the American Business Conference and served as 1981-1982 Chairman of the New England Council of the American Electronics Association and a director of the national AEA organization from 1980 through 1982.

This statement is not offered on behalf of any of the organizations mentioned before, but is instead my conclusions resulting from 31 years experience in the electrical and electronic industry. Sixteen of these years were totally in international trade with nine years residing and working in Great Britain, Germany and Switzerland.

This committee has solicited testimony on how the Federal government can help industry in creating more and better jobs. You have asked for views on the adequacy of investment funds available to high growth industries. You are rightfully concerned with the level of research and development expenditures by American business.

My statement will suggest that our economy's lack of growth and weakness in world trade competitiveness has been largely derived from basic tax policies of the Federal government. I will further suggest that the solution will not be found in adding more nuances to the current corporate tax structure but rather by fundamentally re-examining the structure itself.

Before doing this, however, let me elaborate on problems caused by current policy, particularly for high growth companies.

Firstly, tax policy specifically discriminates against midsize, high growth companies. These are the companies that have provided the highest growth rates in jobs. They are also the companies,

because of high growth and rapid technological obsolescence, that have the highest capital requirements. These companies have outgrown the venture capital size and largely are in the \$25 million to \$1.0 billion sales bracket.

The effective tax paid by companies in this size bracket was more than double during the period 1976-80 of that paid by companies in the Fortune 100 list. At the other end of the scale small business has also been given appropriate tax relief. The precise figure will be released at the March 9, 1983 meeting of the American Business Conference here in Washington.

Studies¹ have concluded that the Accelerated Cost Recovery System (ACRS) offered only tax relief for long lived investments such as structures, but actually represented a tax increase to high growth, high technology firms. This is only one of the many examples of how an ever increasingly complicated tax code fails to produce the desired results.

In other words, the nation does not have a 46% corporate income tax rate as popularly perceived, but rather a variable and constantly changing rate with the highest effective rate usually applying to those high growth companies to whom this hearing is addressed.

¹ See Appendix I

A basic economic research study prepared by Dr. George Hatsopoulos, Chairman and C.E.O. of the Thermo Electron Corporation, Waltham, Massachusetts, establishes that the dramatically increasing gap between the cost of capital in the United States versus Japan has probably had the most adverse effect on the performance of the U.S. economy in the last decade compared to all other factors. This research will be presented to the General Membership Meeting of the American Business Conference on March 9, 1983. I commend it to your attention.

The constantly changing tax rates on corporate profits and the lobbying efforts and resulting complications of the code, have proven to be disappointing at best.

For that reason, this testimony will suggest that the total elimination of the present corporate income tax with the substitution of a consumption based tax is the solution most likely to produce the results desired by these hearings. The reasons for this are as follows:

1. Corporate income tax is in fact a disguised consumption tax. It is a cost that is treated as any other cost of production, such as labor and materials, when pricing products and services to arrive at an AFTER tax profit sufficient to attract investment flow and

provide funds for reinvestment for growth. The tax is passed onto the consumer in any event. The transfer of these taxes to an undisguised consumption tax would not represent any loss of tax revenue.

2. The United States is rapidly becoming alone in relying on income tax, either corporate or personal, as the major source of government revenues. American industry exports bear U.S. income taxes in their pricing and are then further burdened with turnover equalization taxes plus duties upon entry into most major foreign markets. Our foreign competitors are totally refunded all turnover tax content in their products upon export and do not receive a compensating tax upon entering the United States. Even when import duties are identical (which they seldom are) American products are more expensive in export and foreign imports cheaper through tax policy alone. The original GATT negotiations were structured to cause this result without being recognized by the United States. D.I.S.C. legislation was inaugurated as a partial remedy. We have improperly agreed that D.I.S.C. is "unfair" under the GATT treaty and are progressively abandoning this vital provision without any enacted replacement. GATT members have demanded D.I.S.C. repeal and the only undebatable answer is substitution of a consumption based tax for the corporate income tax.

3. As we all know, corporate income tax is double taxation. Dividends are already taxed at full personal income tax rates. The real bearer of the tax on corporate income not allowed to be reinvested is the total U.S. economy. The American worker bears the cruelest burden due to this unproductive cost having been superimposed on the cost of all of our products and services, domestically and in international trade. Is it fair to place the blame so heavily on low productivity or "high American labor costs" for our international trade deficits? The Congress of the United States must also accept its share of the blame.
4. The question of the adequacy of research and development expenditures by American industry has been raised for consideration in these hearings. I agree that they are inadequate in many sectors of high technology, particularly those targeted by Japan. Unfortunately, the solution will not be found in "on and off" short term manipulation of the tax code. If we must live with the present form of corporate income tax, the present targeted research and development tax relief must be strengthened and, most important, made permanent.

However, I submit that tax policy should be supportive of high growth without attempting to judge whether this growth will be accelerated by more research and development expenditures, expanded marketing (particularly in export) improved quality, longer product life, greater reliability, or better service. In our particular company, permanent removal of corporate income tax would result in almost doubling our current levels of research and development expenditures, large increases in marketing expenditures for export including our Japanese sales company and the ability to price our products more aggressively. Other firms and industries would allocate these increased resources in the way to best enhance their growth.

In answer to those who would say that tax relief doesn't work because of the disappointing results of the investment incentive of the Economic Recovery Tax Act of 1981, one must be reminded that the emphasis on those incentives was for installation of new plant and equipment during a period of record high interest rates and high existing over capacity. In other words, this bad timing is a classic case of failure of centralized detailed economic planning. It hasn't worked for 60 years in the Soviet Union and shouldn't be expected to work 60 years later in America.

Thank you for the opportunity to present this statement.

Roger D. Wellington

APPENDIX I

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Prior to the enactment of ACRS most high technology companies depreciated their equipment over 3, 5, or 7 years utilizing the double declining balance method. Table I illustrates in present value terms at various discount rates the level of tax benefits associated with a \$100 investment in such equipment.

Table I
Pre-ACRS

Present Value of Tax Benefits Attributable
to \$100 Investment in Property with Useful Life of 3, 5
and 7 years at Various Discount Rates

Discount Rate	3 years	5 years	7 years
0	\$49.33	\$62.67	\$56.00
6	46.53	47.07	48.78
8	44.40	45.46	48.78
10	43.34	43.97	44.91
12	42.32	42.56	43.23
14	41.38	41.25	41.67

Source: Prepared by Deloitte, Haskins and Sells for the
Computer and Business Equipment Manufacturers Association.

Table II
Post-TEFRA ACRS

Present Value of Tax Benefits Attributable to
\$100 Investment in R&D Equipment and
Other Equipment Held for 5 years or 3 years

Discount Rate	Other Equipment		R&D Equipment
	Held-5 yr.	Held-3 yr.	
0	\$53.70	\$50.62	\$50.62
6	47.37	45.28	46.47
8	46.56	43.73	45.23
10	43.90	42.29	44.06
12	42.35	40.94	42.96
14	40.91	39.68	41.89

Source: Prepared by Deloitte, Haskins and Sells for the
Computer and Business Equipment Manufacturers Association.

Under ACRS the costs of most equipment is recovered over 5 years (with R&D equipment costs recovered over 3 years) on only a slightly accelerated basis; if the equipment is in fact retired before the fifth year (or for R&D equipment, the third year), the remaining unrecovered cost is deducted upon retirement, but the investment credit is recaptured at a rate of 2 per cent for each year the equipment is retired short of 5 (or 3 years). Table II shows the present value of investments in equipment under ACRS after the 1982 Act in the three categories most relevant to high technology companies--R&D equipment, other equipment held for 5 years, and other equipment retired after the end of the third year.

A comparison between the two tables indicates that ACRS as modified by the 1982 Act causes a reduction in tax benefits for most equipment at all realistic discount rates. In particular, the 5-year equipment which is retired after 3 years (i.e., manufacturing equipment used by companies with the most rapidly changing technology), ACRS after the 1982 Act creates a significant tax increase at all discount rates of 6 per cent or greater at 12 per cent discount rate the tax benefits for \$100 of equipment is reduced from \$42.32 to \$40.94. Only for R&D equipment can any increase in tax benefits be shown and then the increase (e.g., from \$42.56 to \$42.95) occurs only if the equipment was depreciated over 5 rather than 7 years under pre-1981 law. On balance, for new investments in equipment the changes enacted in 1981 and 1982 as part of the ACRS system have not been beneficial, and indeed have been somewhat detrimental, to high technology companies.

Senator CHAFEE. We will have some questions for the panel as a whole, Mr. Wellington.

Dr. Sheldon Weinig, please proceed with your testimony.

STATEMENT OF DR. SHELDON WEINIG, PRESIDENT, MATERIALS RESEARCH CORP., ORANGEBURG, N.Y.

Dr. WEINIG. I am happy to be here, Senator. Thank you.

I am also a founding member of the American Business Conference. And as Mr. Wellington has indicated, we are a group of high growth companies. One condition of membership requires that a company has a minimum of 15-percent growth per year over a 5-year period. My company has grown 30 percent per year for the last 5 years, and therefore we qualify as a midrange high growth company.

I would like to discuss some areas that we feel that some legislative modification or initiative might be of some assistance to this group, because as already indicated today it is this particular segment of our industry that does produce the most jobs, and one of the most important problems this country faces is the need to create 20 million jobs in this decade. I think we might spend some time in looking at how we might assist the mid-range growth Companies.

Unfortunately, even if the economy improved markedly, many of the large companies, due to what I call the dashpot effect, which really means present underutilization of their plant and people, would not really start any serious hiring, whereas some of the mid-range companies who have less surplus capacity certainly would begin acquiring more staff.

I would also like to note that the phrase, midrange growth companies, does not necessarily mean only technology companies, but I will concentrate mainly on that area, because my own company is involved in high technology.

One last point, and that is the entrepreneurs—I call midrange growth companies the children of entrepreneurs, at least the adolescent children, and it is something we should be aware and concerned about because entrepreneurship is very unique to this country. Like many wines, it doesn't travel too well; but we still have it here, and it's something we should cultivate and protect.

Senator CHAFEE. What is your definition of an entrepreneur? Is it somebody who takes an idea, has the capital and puts it together to produce something?

Dr. WEINIG. He conceives of the concept of selling a service or a product and reduces it to practice, that is, he makes it happen. Many of them can't survive after the creative period and can't run the companies, but they do get them started. And that's really what in my mind an entrepreneur is.

Mr. Wellington has alluded to the fact that the midrange companies pay proportionately more in taxes than other types of companies and I would just like to put some numbers to that. There will also be an ABC McKinsey report that will be coming out in March which elaborates on this point.

But for today, let's consider the fact that my company, for example, paid in 1981, 37.2 percent its domestic and 40.5 percent on

its overall foreign business. This compares to an average for all industries of 20.5 and 29 percent or comparably nearly twice as much.

Another way of looking at this phenomenon is that midsized companies represent about 23 percent of the sales dollars in this country, and they are paying about 31 percent of the tax dollars. So we see a disproportionate payment of taxes by these midsized companies.

I guess what this really boils down to is how about rewarding the winners instead of the losers and seeing what we can do to promote more winners.

I would like to just stress this point again, although a lot of people have alluded to it, but we certainly ought to be concerned about this group of companies that have a disproportionate capability to produce jobs and a disproportionate capability to create technology. Let's do something, and if need be, let's do something disproportionate—OK?—to make them grow a little bit faster, and reward these winners. Maybe one of these disproportionate benefits could be a tax rate based on growth that is, less taxes for greater growth. I won't go into that any further at this time but commend the concept for your consideration.

Let me move on to some other areas of competitiveness. I would like to next discuss the Export-Import Bank, which, again, was briefly touched upon this morning.

It is very interesting to note that the Export-Import Bank, sir, has announced that it shortly will decrease their minimum loan from \$5 million to \$2.5 million for a single transaction. In a rather informal survey of ABC members I couldn't find anyone who ever had a single transaction overseas of \$2.5 million; but what's really worse is, I couldn't find anyone who has ever used the Eximbank.

So I guess what I'm really trying to say is that the Eximbank is one of the best-kept secrets in the Government relative to utilization by mid-sized companies. It just isn't meaningful.

I was recently at the White House council meeting on international trade, and we discussed this area. One of the points that I raised there, and I raise it here again, is that any major commercial bank would set up a desk, set up a department, set up a division to go after these mid-range companies, and yet we have this thing called the Eximbank that just ignores totally this major segment of our industrial capability.

I would like to make the suggestion that if we are going to retain the Eximbank, for God's sakes, let's also try to get it to be applicable to some of us in the mid-range area, because I do think we could use it if it was available and it offered some meaningful capabilities.

Senator CHAFEE. I suppose they don't want to go out seeking business, because they have got so many applications now which they are struggling to finance.

Dr. WEINIG. Those are all applications of extraordinarily large companies, sir, and they are also court-of-last-resort types of things.

I think in our case, we are kind of excited and ready to move ahead, and if there were some applicability here, some desk that would handle the mid-range growth companies, I suspect that it wouldn't be so awesome.

The major problem, incidentally, for the mid-range company is that when you talk to Eximbank, they show you the pile of applications that are required, and you say, "Thank you very much. I'll try to solve it some other way." It just isn't applicable to us.

I have likened it, in my prepared statement to trying to crop-dust a field with a 747, and that's about the way it is.

Let's move on to DISC, which, again, Mr. Wellington alluded to. I would like to just briefly discuss this area.

I will agree, sir, that no company ever went into the export business because of DISC's existence. Nevertheless, it's an awfully good symbol that our Government is aware of the fact that we are really, in a sense, at a tremendous disadvantage to our trading partners who have things like VAT, territorial tax incentives, and of course the biggest advantage of all today, is the mercantilist policies that many countries are now putting into effect. For example, Japan and our European partners.

So if it is nothing more, it at least signals to us that our Government is aware of the problems that we are facing.

Senator CHAFEE. Are there not other ways of signaling that you've got problems than something that is under attack by GATT? You yourself note that two administrations have put out these warning signals.

We do try to do something to send signals; I put a lot of energy into eliminating the taxation on Americans abroad. I noticed Mr. Wellington served abroad for 9 years.

Did it do any good? Do people like Augat hear about it?

Mr. WELLINGTON. Absolutely. I believe I came to see you specifically to support that. I must say my 9 years didn't benefit from it, unfortunately.

Senator CHAFEE. No; you didn't. You were born too early.

Mr. WELLINGTON. But I do know, among my many friends in the professional world, that it has become substantially easier to attract a skilled American to go overseas and work, under difficult conditions often—family, educational problems, et cetera—because of this progressive measure that you introduced and had passed.

Senator CHAFEE. If the passage of such legislation is really symbolic, if it shows we love you, there should also be other ways of doing that.

Dr. WEINIG. Let me not leave you with the impression that it doesn't help our cashflow. That is a very real aspect of it and the deferred taxes do add up to something in the \$1.6-\$1.8 billion range that are in the DISC accounts. There is nothing wrong with that.

The trouble is that, when I've gone over all of the alternatives that we've discussed, I haven't heard any yet that really excited me, and as long as we remain in this concessionary position or posture to the GATT countries, especially the EEC, then we really have very little choice. And I would just like to encourage in every way possible that we retain DISC, or at least retain the minimum benefits that we now get from it, sir.

I would like to digress on one small point which has always interested me, and that is, we've spoken a great deal about education today, and nobody has spoken about the fact that we are trying to

market in the so-called Pacific basin, and we have no capability or knowledge of that area in this country.

I have some statistics in my prepared statement that there are 15,000 Japanese studying in our technological institutions in this country whereas there are under 500 U.S. students in Japan. The 15,000 here are studying our technology, and the 500 in Japan are studying art and culture and are supported by their fathers, whereas the 15,000 Japanese students are supported by Japanese industry and Government.

Now, we've got to do something about this, because there is no way you are going to sell into the Pacific basin without understanding their culture and their business practices. We all know how complicated it is.

So my idea to make DISC a little bit more acceptable is, why don't we just take a small percentage of this \$1.6 billion of deferred taxes and earmark it for Pacific basin scholarships? I think there are a lot of young people in this country who would not mind going over there and studying.

I have nothing directed in mind. I don't think they should go over there and study business practice; I think they should go over there and study what it's all about, and then they will add to our wealth of knowledge, and that is what is required to penetrate an area. I am very much concerned that we don't know a thing about this area.

Senator CHAFEE. Well, you know, we thought that in a roundabout way we might get some of those similar benefits from eliminating the taxation of Americans abroad. More families would stay abroad so the young children would grow up there, learn the language and customs, and then return home and apply their experience.

You have made a good point. However, I don't think we can limit it to the Pacific basin.

Dr. WEINIG. Well, we seem to have a number of scholarship programs for the Western World, so I thought this might be a way of earmarking some money for the Far East.

I would just indicate anecdotally, on the side, sir, that some families that I know that are in Japan who tried to get their children into Japanese schools were refused, because it's extraordinarily difficult. In fact, it's more difficult to get your kids into their schools than to get your products into their markets. And, you know, you are going to need a little pressure there as well, sir, so I thought maybe a little governmental leverage here might be of some help.

My next area was going to be education. There has been an extraordinary amount—everyone has discussed it, and I don't want to go into it in any great detail other than to, again, just remark on a point. I noted this morning in the newspaper coming down on the shuttle, that a number of engineering schools in the United States are considering limiting the entry of students because of the insufficient number of faculty. That was an unbelievably frightening article in this morning's paper.

Senator CHAFEE. Mr. Packard touched on that subject.

Dr. WEINIG. Yes, and I just wanted to emphasize it briefly.

I must tell one more anecdote, if I may. I was in Japan at Nippon Electric, a very famous and probably their best semiconductor company.

Senator CHAFEE. Did you make a sale?

Dr. WEINIG. We are working desperately hard on it.

Senator CHAFEE. Good luck.

Dr. WEINIG. And while there, this gentleman looked out the window and said, "You see there? We're building a new plant to make 264K RAM's"—264,000 Random Access Memories. And he said, "We're going to start 3,000 silicon wafers a day, and we're going to do this with two people." And you know, you're stunned, but he doesn't let up. He says, "But over there, in that building, we're going to have 300 engineers supporting those two people." Senator, I am, of course, making up the numbers, but you know what I'm trying to say.

Then he said, "But the real thing is that those 300 engineers are going to be studying dirt, and no American engineer would ever study dirt." And therein lies a beautiful story. You know, the only yield problem with semiconductors today is really dirt. And the way it is generally described is that dirt is carried into the process by people, therefore, let's get rid of the people and go to automation.

But, isn't this a concept? Where they could literally—and whether it is true or not in terms of numbers—that they could take hundreds of engineers and put them to work in these areas. Can you just imagine America's son coming home and saying to mother and dad, "Now that I have my degree from Columbia," or MIT, or something, "I am now going to be studying dirt for XYZ Semiconductor?" Let me go on and complete my testimony very rapidly, sir.

Dr. Press referred to the question of capital, that we now have a vigorous, shall we say, society, if you will, or industry of venture capitalists. And that's certainly true. Venture capital has, I think, replaced baseball as the major U.S. sport.

The real problem, and he referred to it, was the second level, and that's what I'm concerned about. Once a company has the venture capital, once it's a startup, once it's got a few million dollars in sales, it now needs the real money. And this is hard money; this is money to put in the equipment, the productivity capability, the robotics, etc. And this is a very serious problem, and this is difficult money to come by. This is where you are paying those exorbitant bank rates. And, businesses at that level, and I remember vividly, don't have any leverage at all. They are paying the highest rate conceived by man. You are talking about several points over prime—those are the people who are paying it. And that's an area where a kind of second-tier type of funding is really required.

I noted another point. The U.S. banks are literally lending money to Japanese companies, with debt ratios that they wouldn't touch in this country, because of the somehow-implied notion that the Japanese Government is supportive of those companies. Well, maybe we need that type of approach.

I noted in my prepared statement that my Japanese company pays a little over 6 percent for its capital, and my U.S. company has paid as high as 21 percent. Need I say more?

Senator, thank you for allowing me to testify. In 1 minute I will prioritize my suggestions:

One, DISC? Retain it. Don't give anything more away. And let's use some money for Pacific basin scholarships.

Two, Export-Import Bank? If we're going to retain it, let's make it available to some of the midrange companies that have a chance to do something really exciting.

Three, in the area of taxes, as I indicated, my company pays twice as much as the national average. At worst, I would like a fair deal; at best, I would like an incentive based on growth.

Four, for education, I can only add my complete endorsement of everything I have heard today. We desperately need educational assistance in this country.

Five, As far as capital goes, may we consider the possibility of a second-tier method of financing growth and technology for these midrange companies?

Senator CHAFEE. Did you hear Mr. Packard's suggestion on that?

Dr. WEINIG. Yes, sir.

Senator CHAFEE. What did you think of that?

Dr. WEINIG. Rather interesting. Rather interesting. I think it addresses a portion of it, and I think there are some very real possibilities there.

Senator CHAFEE. Thank you very much, Dr. Weinig.

Dr. WEINIG. Thank you, sir.

[The prepared statement of Dr. Sheldon Weinig follows:]

SENATE FINANCE COMMITTEE
PUBLIC HEARING ON HIGH GROWTH INDUSTRIES
AND U.S. COMPETITIVENESS
JANUARY 20, 1983

STATEMENT OF DR. SHELDON WEINIG*

I WOULD LIKE TO THANK SENATOR CHAFEE AND THE SENATE FINANCE COMMITTEE FOR INVITING ME TO APPEAR TODAY TO TESTIFY ABOUT OUR COUNTRY'S MID-RANGE GROWTH COMPANIES (\$25 MILLION TO \$1 BILLION IN SALES) AND HOW THEY COULD BECOME MORE COMPETITIVE IN THE INTERNATIONAL MARKETPLACE. THE SUCCESS OF THESE COMPANIES CAN HAVE A SIGNIFICANT POSITIVE EFFECT ON ECONOMIC RECOVERY AND VITALITY IN THE UNITED STATES.

FOR EXAMPLE, ONE OF THE MOST CRITICAL PROBLEMS THAT OUR COUNTRY IS FACED WITH IS THE PROBLEM OF CREATING 20 MILLION JOBS DURING THE NEXT TEN YEARS. A NUMBER OF STUDIES HAVE CLEARLY DEMONSTRATED THAT THE MAJORITY OF JOBS ARE GENERATED BY MID-SIZED GROWTH COMPANIES . IN VIEW OF THIS ALONE, WE SHOULD CONCENTRATE MAJOR EFFORTS AND RESOURCES ON PROVIDING A FERTILE ENVIRONMENT TO STIMULATE THE FORMATION AND GROWTH OF THESE ENTITIES.

*DR. WEINIG IS FOUNDER AND CHIEF EXECUTIVE OFFICER OF MATERIALS RESEARCH CORPORATION, ORANGEBURG, NEW YORK, AND IS CHAIRMAN OF THE INTERNATIONAL TRADE TASK FORCE OF THE AMERICAN BUSINESS CONFERENCE. (MRC HAS GROWN AN AVERAGE OF 30 PERCENT PER YEAR FOR THE LAST FIVE YEARS.)

AN ECONOMIC UPTURN IN THE NEAR TERM, EVEN OF SOME SIGNIFICANCE, WOULD NOT QUICKLY PRODUCE A LARGE NUMBER OF JOBS IN THE VERY LARGE INDUSTRIES COMPARED TO THE MID-RANGE COMPANIES. THE "DASHPOT EFFECT" OF UNDER-UTILIZATION OF PLANT AND PEOPLE IN VERY LARGE COMPANIES COULD ABSORB CONSIDERABLE IMPROVEMENT IN BUSINESS BEFORE SERIOUS HIRING WOULD COMMENCE.

ANOTHER NEGATIVE JOB CREATION FACTOR IS THAT MANY COMPANIES HAVE CONTINUED INVESTMENT, EVEN DURING THE RECESSION, FOR LABOR SAVING EQUIPMENT AND PROCESSES THAT WILL FURTHER MITIGATE AGAINST RAPID JOB RECOVERY. FOR EXAMPLE, THE SALE OF ROBOTICS HAS INCREASED WITHOUT ABATEMENT OVER THE LAST SEVERAL YEARS. IT IS THEREFORE NECESSARY THAT SOME VERY SPECIAL ATTENTION BE GIVEN TO THESE MID-RANGE GROWTH COMPANIES TO OBTAIN SOME MEANINGFUL EFFECTS IN THE DEVELOPMENT OF JOB OPPORTUNITIES.

ALTHOUGH A LARGE NUMBER OF THE FAST GROWING MID-RANGE COMPANIES ARE IN AREAS OF HIGH TECHNOLOGY, WE SHOULD BY NO MEANS RESTRICT OUR THINKING TO ONLY TECHNOLOGICAL COMPANIES. HOWEVER, SINCE I AM DIRECTLY INVOLVED WITH A HIGH TECHNOLOGY COMPANY, MUCH OF WHAT I SAY WILL BE DIRECTLY RELATED TO THIS AREA. MANY MID-RANGE COMPANIES ARE THE ADOLESCENT CHILDREN OF ENTREPRENEURS, AND SINCE I BELIEVE THAT ENTREPRENEURSHIP IS ONE OF AMERICA'S GREATEST STRENGTHS

(FORTUNATELY, ONE THAT WE HAVE NOT EXPORTED BECAUSE IT DOESN'T SEEM TO TRAVEL WELL), WE SHOULD ALSO BE THINKING ABOUT HOW TO NURTURE ENTREPRENEURS FOR FUTURE ECONOMIC REVITALIZATION.

MY REMARKS TODAY WILL EXAMINE SOME AREAS WHERE I BELIEVE THE MID-RANGE GROWTH COMPANIES CAN BE ASSISTED BY SOME MODIFICATIONS AND INITIATIVES IN EXISTING GOVERNMENT POLICIES.

NEEDLESS TO STATE, THE AMERICAN BUSINESS CONFERENCE WOULD BE DELIGHTED TO WORK WITH YOU ON THE IMPLEMENTATION OF ANY OF THESE SUGGESTED LEGISLATIVE INITIATIVES.

A. CORPORATE TAXES

I SUPPOSE THAT IT IS CUSTOMARY FOR EVERY INDIVIDUAL AND CORPORATION TO MAKE A STATEMENT ABOUT THE ONEROUS NATURE OF TAXES. WE ARE NO DIFFERENT EXCEPT THAT WE BELIEVE YOU WILL BE SHOCKED TO LEARN THAT THE MID-RANGE GROWTH COMPANIES PAY A DISPROPORTIONATE AMOUNT OF CORPORATE INCOME TAXES. ALTHOUGH AN ABC-SPONSORED STUDY BY MCKINSEY & COMPANY WILL BE RELEASED IN MARCH 1983 SUPPORTING THIS OVERALL CONCLUSION, I WOULD LIKE TO PRESENT THE FACTS TODAY FOR MY COMPANY, MATERIALS RESEARCH CORPORATION, IN ORDER TO ILLUSTRATE THE POINT.

FOR 1981. THE AVERAGE EFFECTIVE CORPORATE TAX RATES FOR ALL INDUSTRIES WERE 20.5 PERCENT ON U.S. INCOME AND 29.7 PERCENT ON OVERALL WORLDWIDE INCOME. MRC WAS 37.2 PERCENT AND 40.5 PERCENT RESPECTIVELY. EVEN IF WE LOOK AT TWO SPECIFIC AREAS THAT MIGHT BE APPROPRIATE TO OUR BUSINESS, WE SEE A MARKED DIFFERENCE. I REPEAT, GENTLEMEN, THE RESULTS OF THE ABC-MCKINSEY REPORT WILL BE PROFOUND IN THEIR IMPLICATIONS.

EFFECTIVE CORPORATE TAX RATE BY INDUSTRY 1981

	<u>ON U.S.</u> <u>INCOME</u>	<u>ON</u> <u>WORLDWIDE</u> <u>INCOME</u>
(1) AVERAGE FOR ALL INDUSTRIES	20.5%	29.7%
(2) INSTRUMENT COMPANIES	26.8%	34.4%
(3) ELECTRONICS COMPANIES	29.3%	33.2%
(4) <u>MATERIALS RESEARCH CORP.</u>	<u>37.2%</u>	<u>40.5%</u>

WE SEE THAT PARADOXICALLY, THOSE COMPANIES WHICH MOST NEED THEIR MONIES FOR REINVESTMENT ARE DEPRIVED OF THE FUNDS BY AN INEQUITABLE DISTRIBUTION OF TAX BURDEN. FOR EXAMPLE, MID-SIZED CORPORATIONS IN THE U.S. ECONOMY REPRESENT 23 PERCENT OF THE SALES DOLLARS AND PAY 31 PERCENT OF THE TAX DOLLARS.

WE ARE NOT ASKING FOR RELIEF FROM TAXES FOR MID-RANGE GROWTH COMPANIES. BUT WE WOULD CERTAINLY BE INTERESTED IN A TAX POLICY THAT DOESN'T DISCRIMINATE AGAINST THEM. IN OTHER WORDS, LET'S REWARD WINNERS INSTEAD OF LOSERS. I MIGHT ALSO NOTE THAT MANY OF THE ENTREPRENEURS RUNNING THESE COMPANIES ALSO PAY THEIR HONEST FULL SHARE OF TAXES AND THEY MIGHT WELL BE ONE OF THE FEW GROUPS OF INDIVIDUALS THAT DO.

I WOULD LIKE TO HAVE YOU CONSIDER A TECHNIQUE OF REWARDING WINNERS SO THEY COULD GO ON TO EVEN GREATER SUCCESS. REMEMBER THAT THE SUCCESS OF THE MID-RANGE GROWTH COMPANIES MEANS DISPROPORTIONATE JOB CREATION AND TECHNOLOGY CREATION. WHY NOT DO ALL WITHIN OUR POWER TO ASSIST THEM IN THEIR SUCCESS RATHER THAN DISPROPORTIONATELY TAXING THEM? WHAT I HAVE IN MIND IS A TECHNIQUE OF FASTER GROWTH MEANS LOWER TAXES. GROWTH PARAMETERS WOULD HAVE TO BE MEASURED BY SUBSTANTIVE TECHNIQUES AND NOT BY ACQUISITIONS OR INFLATION. THE ABC-MCKINSEY REPORT, WHICH I REFERRED TO EARLIER, WILL POINT THE WAY TO CERTAIN FINANCIAL PARAMETERS THAT CAN BE USED TO DEFINE GROWTH.

B. EXPORT-IMPORT BANK

THERE HAS BEEN CONSIDERABLE DISCUSSION ABOUT THE ROLE OF THE EX-IM BANK IN ASSURING AMERICAN COMPETITIVENESS OVERSEAS. IT IS INTERESTING TO NOTE THAT ONE OF THE

PROPOSALS ON PROCEDURE MODIFICATION OF THE EX-IM BANK THAT IS BEING CONSIDERED IS THE REDUCTION OF THE MINIMUM LOAN TRANSACTION FROM \$5 MILLION TO \$2-1/2 MILLION. IN AN INFORMAL SURVEY OF ABC MEMBERS, I HAD A DIFFICULT TIME FINDING ANYONE WHO EVER HAD A \$2-1/2 MILLION SINGLE OVERSEAS TRANSACTION, LET ALONE \$5 MILLION. IN FACT, IT WAS DIFFICULT TO FIND ANYONE WHO HAD ANY DEALINGS WITH THE EX-IM BANK. IT IS ONE OF THE BEST KEPT SECRETS IN GOVERNMENT RELATIVE TO MID-SIZE COMPANIES. THE EX-IM BANK AS NOW CONSTITUTED IS JUST NOT A VEHICLE FOR MID-SIZED COMPANIES. IN FACT, THERE IS SOME QUESTION AS TO ITS EFFECTIVENESS WITH LARGE COMPANIES. EXPORT FINANCING CAN BE A KEY TO A PARTNERSHIP BETWEEN GOVERNMENT AND INDUSTRY, WHEREAS MOST PEOPLE SEE EX-IM AS A "GUARANTOR OF LAST RESORT".

I RAISED THIS QUESTION OF EX-IM BANK EFFECTIVENESS FOR MID-RANGE COMPANIES AT THE WHITE HOUSE COUNCIL MEETING ON INTERNATIONAL TRADE ON DECEMBER 16, 1982, WHERE I REPRESENTED THE AMERICAN BUSINESS CONFERENCE. I SUGGESTED THAT WE EXAMINE HOW LARGE COMMERCIAL BANKS DEAL WITH THE PROBLEM. ALL COMMERCIAL BANKS HAVE DESKS OR FULL DEPARTMENTS TO SERVE THE MID-RANGE COMPANY. WE WOULD LIKE TO SEE THE EX-IM BANK DO LIKEWISE. THE ARGUMENT THAT IT IS NOT EFFICIENT OR PRACTICAL TO PROCESS SMALLER LOANS FOR MID-RANGE COMPANIES IS TRUE ONLY IF YOU ARE NOT ORGANIZED FOR THE TASK. IT IS EQUALLY IMPRACTICAL TO CROPDUST A FIELD WITH A BOEING 747.

AMBASSADOR WILLIAM BROCK NOTED AT THE WHITE HOUSE TRADE COUNCIL MEETING THAT THIS COUNTRY CAN NEVER BE SERIOUS ABOUT INTERNATIONAL TRADE UNTIL WE HAVE THOUSANDS OF MID-RANGE COMPANIES ACTIVELY INVOLVED IN TRADE. THAT IS HOW WE CAN GET EXPLOSIVE ECONOMIC GROWTH.

THEREFORE, TO REITERATE, IN ORDER FOR THE EX-IM BANK TO PLAY A MEANINGFUL ROLE IN STIMULATING THE EXPORTS OF THE MID-RANGE COMPANIES, THEY MUST ESTABLISH DEPARTMENTS CAREFULLY DESIGNED TO SERVE THE SPECIAL NEEDS OF THESE COMPANIES. FOR EXAMPLE, IT IS POSSIBLE THAT NOT ALL OF THE MONIES ARE NEEDED FOR FINANCING OF EXPORTS OR IMPORTS. SOME MONIES MIGHT BE USED TO ASSIST THESE COMPANIES ASSESS AND PENETRATE AN OVERSEAS MARKET. (INCIDENTALLY, THERE HAVE BEEN SUGGESTIONS THAT THE NEW EXPORT TRADING COMPANY ACT WILL FACILITATE SOME OF THE ABOVE, BUT IN REALITY IT WILL NOT, ESPECIALLY FOR COMPANIES WHO MARKET HIGHLY TECHNICAL PRODUCTS.)

C. DISC

GENTLEMEN, I KNOW THAT NO MID-RANGE GROWTH COMPANY INITIATED AN EXPORT EFFORT BECAUSE OF THE EXISTENCE OF DISC. NEVERTHELESS, ITS EXISTENCE HAS BEEN A STRONG SIGNAL TO U.S. COMPANIES THAT OUR GOVERNMENT IS AWARE OF THE

UNEVENNESS OF THE CONDITIONS UNDER WHICH WE DO BUSINESS OVERSEAS. I ASSURE YOU THAT DISC DOESN'T BEGIN TO MAKE UP FOR THE ADVANTAGES ACCORDED OUR TRADING PARTNERS BY THE VAT, TERRITORIAL TAX BENEFITS AND THE PROFOUND MERCANTILIST POLICIES OF SOME COUNTRIES! IT DOES SYMBOLIZE CONCERN BY OUR GOVERNMENT AND DOES MODESTLY IMPROVE OUR CASH FLOW. IT BUYS MORALE AND THAT IS A SOMEWHAT HARD-TO-COME-BY COMMODITY IN THE INTERNATIONAL MARKET TODAY IN THE SHADOW OF STRONG DOLLARS AND NUMEROUS BARRIERS.

WE HAVE BEEN QUITE UPSET THAT IN TWO SUCCESSIVE ADMINISTRATIONS, MEMOS HAVE BEEN GENERATED THAT CONCEDED THE GATT UNACCEPTABILITY OF DISC WITHOUT ANY CONSIDERATION FOR THE U.S. POSITION. WE APPRECIATE THAT IT IS NOT PRACTICAL TO OBTAIN SIGNIFICANT NEW CONCESSIONS FROM OUR EUROPEAN TRADING PARTNERS DURING THIS RELATIVELY POOR ECONOMIC PERIOD, BUT WE CERTAINLY WANT TO URGE THAT, AT MINIMUM, THE EXISTING BENEFITS OF DISC BE RETAINED. THERE ARE A NUMBER OF LEGISLATIVE SUGGESTIONS THAT HAVE BEEN MADE TO MAKE DISC A GATT-ACCEPTABLE DEVICE. I WON'T REVIEW THEM AS I AM SURE THEY ARE WELL KNOWN TO ALL OF YOU, ALTHOUGH I MIGHT OBSERVE THAT SOME OF THEM ARE SO CONTRIVED THAT THEY WOULD PROBABLY VIOLATE THE FOREIGN CORRUPT PRACTICES ACT.

LET ME DIGRESS BRIEFLY AND DISCUSS ANOTHER ASPECT OF DISC. IT WAS SET UP TO ENCOURAGE EXPORTS. ONE OF THE SIGNIFICANT

PROBLEMS OF EXPORTING INTO THE PACIFIC BASIN AREA IS THAT WE AS A COUNTRY KNOW SO LITTLE ABOUT THE LANGUAGE, CUSTOMS, BUSINESS PRACTICES OF THAT AREA OF THE WORLD. EVEN IF WE COULD ACCOMPLISH THE ELIMINATION OF ALL BARRIERS TO COUNTRIES SUCH AS JAPAN, WE KNOW VERY LITTLE ABOUT THE SELLING AND BUSINESS PRACTICES OF THE COUNTRY. THERE ARE PRESENTLY FEWER THAN 500 U.S. STUDENTS STUDYING IN JAPAN, WHEREAS THERE ARE OVER 15,000 JAPANESE STUDYING IN THE U.S. THE JAPANESE STUDENTS ARE MAINLY IN TECHNICAL SCHOOLS AND ARE SUPPORTED BY INDUSTRY AND GOVERNMENT, WHEREAS THE 500 U.S. STUDENTS ARE MAINLY IN THE ARTS AND ARE SUPPORTED BY THEIR FATHERS.

IF WE ARE TO EFFECTIVELY PENETRATE THE PACIFIC BASIN MARKETS, WE WILL REQUIRE A LARGE CADRE OF PEOPLE VERSED IN LANGUAGE, CUSTOMS AND THE ART OF DOING BUSINESS IN THOSE AREAS OF THE WORLD. CONSIDER THAT DISC NOW GENERATES APPROXIMATELY \$1.6 BILLION PER YEAR IN DEFERRED TAXES. IF WE WERE TO USE SOME SMALL PERCENTAGE OF THOSE FUNDS FOR "PACIFIC BASIN SCHOLARSHIPS" TO ASSIST U.S. STUDENTS IN PURSUING EDUCATION IN THAT PART OF THE WORLD, WE WOULD BE TRULY MOVING TOWARD THE ENHANCEMENT OF EXPORT. I DON'T BELIEVE THAT ANY COMPANY WOULD OBJECT TO GIVING UP A FEW PERCENT OF THEIR DEFERRED TAXES IN DISC TOWARD THIS OBJECTIVE. SOME U.S. GOVERNMENTAL PRESSURE WOULD ALSO BE REQUIRED TO ASSIST IN GETTING THE STUDENTS INTO APPROPRIATE

SCHOOLS IN THE PACIFIC BASIN, AS THAT IS EVEN MORE DIFFICULT THAN GETTING OUR PRODUCTS INTO THEIR COUNTRY.

IF I MAY REVIEW OUR POSITION ON DISC:

- . WE URGE THAT DISC BENEFITS BE MAINTAINED TO ENCOURAGE EXPORTERS.
- . WE URGE THAT CONCESSIONS BE SOUGHT FROM OUR TRADING PARTNERS TO MAKE THE RULES UNDER WHICH WE TRADE MORE EQUAL.
- . WE URGE THAT THE GOVERNMENT ATTEMPT TO DISSUADE MERCANTILIST OR CARTEL POLICIES ABROAD WITH OTHER THAN ACCESS TO OUR MARKET AS THE NEGOTIATING TACTIC. (THE CLOSING OF THE U.S. AS A MARKETPLACE FOR OUR FOREIGN TRADING PARTNERS DOESN'T MAKE OUR COMPANIES OR PRODUCTS MORE COMPETITIVE OVER THE LONG TERM.)
- . WE URGE THAT A PORTION OF DISC FUNDS BE USED TO SET UP A SCHOLARSHIP PROGRAM FOR U.S. STUDENTS TO STUDY IN THE PACIFIC BASIN.

D. EDUCATION

ALTHOUGH THIS IS NOT AN AREA IN WHICH I WILL MAKE SPECIFIC RECOMMENDATIONS AT THIS TIME, I FEEL THAT IT IS IMPERATIVE THAT WE KEEP EMPHASIZING THE INABILITY OF OUR EDUCATIONAL SYSTEM TO KEEP UP WITH THE ENGINEERING DEMANDS OF TECHNOLOGICAL GROWTH.

(1) WE HAVE AN INSUFFICIENT NUMBER OF ENGINEERS.ANNUAL GRADUATES IN ELECTRICAL ENGINEERING & COMPUTER SCIENCE

	BS	MS	PH.D
JAPAN (1981)	20,000	1,700	200
UNITED STATES (1981)	12,500	3,400	500
UNITED STATES (1980)	15,410	4,900	682

(2) A LARGE PERCENTAGE OF ENGINEERS SEEK EMPLOYMENT IN OTHER THAN ENGINEERING AREAS. FOR EXAMPLE, MORE ENGINEERS GO INTO BUSINESS SCHOOLS FOR MBA DEGREES THAN ANY OTHER CATEGORY OF UNDERGRADUATE DISCIPLINE. INTERESTINGLY ENOUGH, ONE MIGHT EXPECT THAT THIS COMBINATION OF ENGINEERING AND BUSINESS WOULD PRODUCE A VERY SPECIAL TALENT, BUT ALAS, IN REALITY IT HAS NOT, IN FACT, IT HAS PRODUCED "MISFITS". THE COMBINATION SIMPLY HASN'T WORKED. WE MIGHT ALSO NOTE THAT

JAPANESE ENGINEERING GRADUATES USUALLY DO NOT GO ON TO ADVANCED TRAINING AND THOSE WHO DO ARE SPECIFICALLY STUDYING TO BECOME PROFESSORS.

(3) WE HAVE A DECREASING NUMBER OF TECHNICALLY UP-TO-DATE, DEDICATED FACULTY IN OUR ENGINEERING SCHOOLS. THE NATION HAS APPROXIMATELY 20,000 ENGINEERING FACULTY JOBS, OF WHICH NEARLY 15 PERCENT, OR 2,500, ARE PRESENTLY UNFILLED. IN FIELDS SUCH AS SOLID-STATE ELECTRONICS, COMPUTER ENGINEERING, AND DIGITAL SYSTEMS, THE NATIONAL SCIENCE FOUNDATION PLACES THE SHORTAGE CLOSER TO 50 PERCENT. TO FURTHER EXACERBATE THE PROBLEM, MANY PROFESSORS ARE BEING LURED OUT OF THE UNIVERSITY INTO INDUSTRY. WE FIND FURTHER THAT A NUMBER OF UNIVERSITIES HAVE REPORTED THAT NEARLY 80 PERCENT OF ALL NEW FACULTY IN ENGINEERING DISCIPLINES ARE FOREIGN. THIS IS BECAUSE AN INCREASING PERCENTAGE OF THE DOCTORAL CANDIDATE POOL IS FOREIGN.

ENGINEERING Ph.Ds - PERCENTAGE OF FOREIGN STUDENTS*

1964 - 19.8%	1977 - 41.5%
1974 - 38.7%	1978 - 45.0%
1975 - 41.3%	1979 - 45.6%
1976 - 42.3%	1980 - 46.3%

*SOURCE: NATIONAL SCIENCE FOUNDATION.

THIS DEMAND FOR WORKING ENGINEERS CAN ONLY INCREASE. THIS IS NOT A SHORT TERM DILEMMA, BUT WILL BE WITH US FOR THE COMING DECADES. SIGNIFICANT INVESTMENT MUST BE MADE IN OUR EDUCATIONAL SYSTEM TO ALLEVIATE THIS PROBLEM IF WE ARE TO BE TECHNOLOGICALLY COMPETITIVE IN THE WORLD.

IN THE LAST TWO DECADES, WHILE MANY TRADITIONAL EDUCATIONAL INSTITUTIONS ADOPTED AN OSTRICH-LIKE POSTURE, A COMPETITOR OF GREAT STRENGTH AND DYNAMISM EMERGED. AMERICAN INDUSTRY DEVELOPED A "SHADOW EDUCATIONAL SYSTEM". XEROX HAS A COMPLETE COLLEGE CAMPUS, IBM GRANTS DEGREES. EVEN SMALL AND MID-SIZED COMPANIES HAVE FULL-TIME FACULTY MEMBERS AND COMPLETE CLASSROOM FACILITIES. AMERICAN INDUSTRY HAS ALREADY INVESTED MORE THE \$40 BILLION IN ITS EDUCATIONAL SYSTEM, AS COMPARED WITH JUST \$60 BILLION IN THE CONVENTIONAL EDUCATIONAL SYSTEM. WHILE INDUSTRY TRAINING PROGRAMS HAVE BEEN PRAGMATIC, THEY HAVE NOT BEEN ENTIRELY SUCCESSFUL.

THE ROLE OF GOVERNMENT MUST BE LEADERSHIP AND SEED MONEY. IT MUST BE THE CATALYST THAT MARRIES THE PARTIES. INDUSTRY HAS THE MONEY AND KNOWS WHAT SKILLS IT WILL NEED. ACADEMIA HAS THE TEACHERS AND STUDY FACILITIES NECESSARY FOR PROVIDING TRAINING AND SERVICES. GOVERNMENT, WITH A VESTED INTEREST IN PROVIDING JOBS AND UPWARD MOBILITY, MUST HELP THEM TO REALIZE THEIR SYMBIOTIC NEED FOR EACH OTHER.

GOVERNMENT SHOULD CALL AND LEAD A SERIES OF CONFERENCES WITH REPRESENTATIVES OF INDUSTRY AND ACADEMIA TO ESTABLISH GOALS AND OBJECTIVES.

E. CAPITAL

THE LAST AREA THAT I WOULD LIKE TO DISCUSS IS THAT RELATED TO THE GROWTH INDUSTRIES' NEED FOR CAPITAL FOR EXPANSION OF PRODUCTION FACILITIES, AUTOMATION AND TECHNOLOGICAL INVESTMENT. THEY MUST INVEST FOR COMPETITIVE EFFECTIVENESS AND MUST OBTAIN THE CAPITAL AT COMPETITIVE RATES.

IN JAPAN MY COMPANY IS AND HAS BEEN PAYING JUST OVER 6 PERCENT FOR ITS MONEY, WHEREAS IN THE UNITED STATES THE NUMBER HAS BEEN AS HIGH AS 21 PERCENT AND IS PRESENTLY ABOUT 9 PERCENT. WHAT IS EVEN MORE INTERESTING IS THAT U.S. BANKS HAVE LOANED MONEY TO JAPANESE CLIENTS AT DEBT RATIOS AT WHICH THEY WOULD NOT LEND TO THEIR U.S. CLIENTS BECAUSE THE JAPANESE COMPANIES ARE PERCEIVED AS BEING SUPPORTED BY GOVERNMENT GUARANTEES.

I BELIEVE THAT WE CAN DEVELOP A LEGISLATIVE IDEA FOR HAVING A SECOND TIER AVAILABILITY OF MONEY FOR GROWTH COMPANIES WHERE THE HURDLE RATE WILL BE SIGNIFICANTLY LOWER BECAUSE OF GOVERNMENT GUARANTEES. THE FUND COULD BE EARMARKED FOR

TECHNOLOGY OR PRODUCTIVITY. UNDER PRESENT FINANCING METHODS AVAILABLE TO MID-RANGE GROWTH COMPANIES, MANY OUTSTANDING TECHNICAL PROGRAMS ARE LEFT ON THE DRAWING BOARD AND THIS COUNTRY CANNOT AFFORD SUCH AN EXTRAVAGANCE.

SENATOR CHAFEE, I WANT TO THANK YOU AGAIN FOR ALLOWING ME TO TESTIFY TODAY. ALLOW ME ONE LAST MINUTE TO PRIORITIZE MY SUGGESTIONS.

1. DISC

RETAIN IT!

DON'T GIVE ANYTHING MORE AWAY!

USE SOME OF THE MONEY FOR PACIFIC BASIN SCHOLARSHIPS.

2. EXPORT-IMPORT BANK

IF WE ARE GOING TO RETAIN, LET'S MAKE ITS MONEY AND SERVICES AVAILABLE TO MID-RANGE GROWTH COMPANIES WITH A SPECIAL DESK.

3. TAXES FOR MID-RANGE GROWTH COMPANIES

AT WORST, A FAIR DEAL; AND AT BEST, AN INCENTIVE FOR GROWTH.

4. EDUCATION

LET'S HAVE SOME CONFRONTATIONAL MEETINGS BETWEEN EDUCATORS AND INDUSTRY AND SET HARD PRIORITIES.

5. CAPITAL AVAILABILITY

CONSIDER A SECOND-TIER METHOD OF FINANCING GROWTH AND TECHNOLOGY FOR MID-RANGE GROWTH COMPANIES.

I WISH TO OFFER THE COOPERATION AND ASSISTANCE OF MYSELF AND THE AMERICAN BUSINESS CONFERENCE IN ANY LEGISLATIVE INITIATIVES THAT YOU OR THE COMMITTEE MAY WISH TO PURSUE.

Senator CHAFEE. Mr. Wisnosky, good morning, please proceed with your statement.

**STATEMENT OF DENNIS E. WISNOSKY, VICE PRESIDENT,
INDUSTRIAL SYSTEMS GROUP, GCA CORP., NAPERVILLE, ILL.**

Mr. WISNOSKY. GCA Corp., which is located in Bedford, Mass., also had a very, very fast track of growth, increasing some 5 times in the past 5 years. Our products include equipment for companies such as Hewlett-Packard, that make semiconductors, precision scientific equipment and, for the last year and a half, industrial robots.

We trade worldwide—we have partners in Europe, recently announcing a joint venture with Matra, supported by the French Government, to a certain extent with Sumatomo in Japan, and we also buy and make robots that we import and export from Japan.

What I would like to talk about is the need to provide a constructive environment within which both entrepreneurs can invent and bring products to the market, and potential users can clearly see the way to afford the necessary implementation. It seems to me that we have to address both sides of this issue, not only one side.

I have five specific recommendations that I think address this problem:

First off, there has been much said about increasing R&D funding. I would only add a slight twist to this, because I think, in terms of basic research, we are doing a great deal, not that we couldn't do more of somewhat of a directed nature in problems of the future rather than problems of the past. I am talking about science rather than social issues, as was mentioned earlier.

My opinion is that we should be spending a lot more money on the research and development that has to do with manufacturing technology. And that's really where our problem right now is, particularly in nondefense areas.

Senator CHAFEE. How should we spend these Federal funds?

Mr. WISNOSKY. We would form coalitions and consortia of both universities and private-sector companies that are in high-growth areas, such as robotics and universities. And these consortia would get together to solve a problem that all of their members had a particular interest in. It might be that the problem of the companies was to bring a product to market at some time in the future or to solve a problem in adding a new technology, such as sensors or vision might be needed for an industrial robot, that they couldn't do on their own.

There are examples of that that occur——

Senator CHAFEE. You are making a suggestion which is quite different from what others have made, if I understand you correctly. There have been a host of witnesses who have pressed for more Federal funding for basic research in the universities.

I understand you to say that the Federal Government should assist R&D programs, or developmental programs, by taking the basic research and translating it into products. Now, this is a different area.

We have had proposals that companies be permitted to go into consortia, and proposals to change the antitrust laws. But no one previously has asked for Federal money.

Mr. WISNOSKY. I would stop short of actual products, but I would go all the way to developing technology that companies could use to enable them to more productively produce products that they currently have and to at least stay even in the world technological marketplace.

Senator CHAFEE. What do the other witnesses say? What do you say about that, Mr. Wellington?

Mr. WELLINGTON. I believe that the idea of working inbetween industry and universities must be heavily increased. I'm not sure the Federal Government has a clearly defined role in that sort of project in the State of Rhode Island. The University of Rhode Island, as I'm sure you know, has a substantial robotics development program, with all cooperative funding by industry.

To the extent that the underlying scientific capability of that university would be strengthened in order to support programs such as that in others, I think that would be the most constructive approach, similar to what has been discussed by some of the other witnesses.

Senator CHAFEE. You heard Mr. Packard say that he thought these things had not been successful.

Mr. WISNOSKY. He was talking about a different kind of thing. He talked about particular products. The Rhode Island situation is an example, a case in point. Over the past 3 years—and we support that program—the top three researchers have left that program and have moved on to private industry.

Now, that may be good for those particular companies that they went to. And I believe we also showed the universities in that program that we like to encourage the revolving-door policy, but that particular action caused many of the member companies to drop out because they could no longer see a way of getting their particular problems solved.

There are precedents—there have been three—for the kind of thing that I'm talking about. NSF had a program called RAND, Research Applied in the National Need. A lot of that money went to Stanford, and then when people left the Stanford program, Stanford Research Institute, spun off into growth companies in robotics and in vision.

The NCOP, which existed under President Nixon, which was the National Center for Activity and Quality of Working Life, had programs that they were beginning to start. And that was canceled.

There was a program called Cooperative Generic Technology program, whose first project was going to be in Detroit. That program was canceled before it had a chance to do anything.

And now there's the Productivity Council, and I would encourage that whatever the Productivity Council comes up with, that they at least be given a chance to try it rather than have their start aborted as well.

We don't have a national industrial strategy in this country. And it seems to me that having one, any one, is better than having none at all.

Once we pick one, we have to then stick with it for a long enough time to find out whether it makes a difference.

What I just did was run through my recommendation No. 2, which is to stabilize policies that we have.

Third, I will second or third or fourth the idea of revamping anti-trust legislation. In my testimony I talk about the same MCT, or Microelectronics and Computer Technology Corp., that has already been started. It is extremely complex, as you suggest.

I believe that we do need to revamp the antitrust laws to allow more cooperation among all of us; however, I must also add that in my experience, when I was on your side of the table, Senator, as a Government worker, I found that many times those same laws could be used to duck the responsibility of working with your competitors, or working with other industries where the need was to work together as opposed to compete in foreign markets rather than here.

Senator CHAFEE. Are you familiar with Senator Mathias' proposed legislation?

Mr. WISNOSKY. I am not. No, sir.

Senator CHAFEE. I am not familiar with it myself, but apparently Senator Mathias and Senator Hart introduced legislation last year dealing with changes in the antitrust laws. I would be interested in what you think.

Mr. WISNOSKY. OK.

Senator CHAFEE. Please proceed.

Mr. WISNOSKY. The last question on that one is, we really have to ask ourselves the question about who we are competing with. In my opinion it is far more internationally than it is nationally.

Recommendation four is to encourage long-term investment. This one has also been talked about somewhat here. I would like to use a couple of examples that aren't in the written testimony about the advantages that a typical Japanese manufacturer enjoys:

If he needs long-term credit, he goes to a thing called the Long-Term Credit Bank of Japan, Ltd.—now, that's pretty explicit—which was created by the Long-Term Credit Bank law 30 years ago. In 1974 this bank ran an ad in the Wall Street Journal that stated that 136 of Japan's 200 largest corporations were their customers, so most of them, and that their assets were \$16.5 billion; they had current loans of \$11.7 billion.

There are also two more government-chartered long-term credit banks in Japan if this one turns down his loan. And I concur with Dr. Weinig that the companies that go after these kinds of things are companies that are his size and our size. This Japanese money is at prime or lower to encourage growth, rather than the United States has which is at prime or higher which discourages growth.

All of the financial rules of the Japanese manufacturing game are different. They have lower cost of funds, currently 8.5 percent for short-term money; they are more highly leveraged; and they have assets-to-equity ratios approaching 6 to 1 versus the 2 to 1 that we try to work under.

Their capital markets are certainly the best in the world today, and that's caused partially by the fact that the Japanese save 20 percent of household income versus 6.5 in the United States.

The last report that we have is that Americans in this last year—this last half of this last year—also saved more than ever before. And I have got to believe that that is a consequence, in part, of the tax law reform that was passed.

Concerning the importance of these investment laws for buying technology such as robots here, we borrow money for 2 years at 14 percent, but a Japanese manufacturer can get a 10-year, 3-percent interest loan to buy robots from the Japan robot-leasing company.

In England a manufacturer can get a government grant for 33.5 percent of the robot's cost, and depreciate the remainder in the first year.

I would like to also give you this as part of the testimony: It's Information Technology's "Government Support for Industrial Robots" from the Department of Industry in England.

One of the things that they say here that intrigues me very much is that no application may be smaller than £25,000, about \$40,000—they are looking for big investments—and that it is going to take them, the U.S. Government, 6 to 8 weeks to give the company the answer.

Now, I spent last week in England, and I didn't talk to anybody who hadn't gotten a positive answer.

Senator CHAFEE. Do you have some material on that?

Mr. WISNOSKY. Yes, here it is.

The reason for that kind of a policy is, I believe it follows the psychology axiom of "behavior changes before attitude"—get this equipment in, put it to use, the users will then like it.

The next recommendation, recommendation five, has to do with the encouragement of skilled labor, and it parallels what has already been said about the education of our people, by others, and so I won't go into that again.

And in the testimony I talk about the relative number of engineers, et cetera, which has been said before.

I would like to end this recommendation five, and it's really the post-amble to all five of my recommendations, by another example:

The reason that we're number one, in my opinion, in the grain-producing nations of the world is that we did establish a coalition with the Department of Agriculture—we established extension services under the Department of Agriculture, State universities, and the farmers back in the 1930's.

I believe that we should have a similar coalition between the Department of Commerce, the colleges, universities, and technology-based growth industries; something very, very specific, rather than in general saying we have to do better in these areas.

In closing, I believe that enacting legislation following these recommendations can create, will create a stable economic environment for R&D and capital investment, an environment which can promote high tech and high growth industries and can spark and revitalize our ability to compete abroad.

Senator CHAFEE. Do you think American manufacturers put much emphasis on competing abroad? You've got such a broad market here in the United States, how much attention, say in your company, Dr. Weinig, do you put on selling abroad? Of course, you have your Japanese affiliate.

Dr. WEINIG. We have the Japanese company, and we have six European. We are a little different, as I think both of the gentlemen on my sides are, that being in a technical field we follow our customers, so that my plant in Japan is 8 kilometers from Texas Instruments', my plant in Palouse is down the street from Motorola, and so forth; because technology has moved out very rapidly and become internationalized.

However, if you are not being forced by your literal customers, in a sense, I don't think there has been enough emphasis placed on internationalization of your businesses, because as you say the markets are enormous here.

When we became aware of it was when we were being intruded upon by the overseas competitors, and then we suddenly realized, "My goodness, we'd better get over there and invest in their marketplace and find out what's happening."

But the fact remains that we still have an enormous market in the United States which is very tempting, and I think it's too tempting for many companies.

Senator CHAFEE. Mr. Wellington, you have set up a wholly owned subsidiary in Japan and are operating there. Are all the obstacles we are hearing about there? How did you make out?

Mr. WELLINGTON. Well, I think we were careful doing our homework. We are 100-percent owners of that subsidiary.

I think the history of Japan demanding joint ventures is largely by, except in certain very delicate areas that they have some industrial policy on. But our greatest area is the very complicated distribution systems that are in existence in Japan.

I must say I don't believe those distribution systems were established to ban imports.

For our particular business, I've been very pleased with our success in penetrating the Japanese market and cannot say that we have encountered any barriers other than we ourselves may have by our relative inexperience in the marketplace.

Senator CHAFEE. Dr. Press mentioned something about the ability to market and distribute. In other words, even if we have all the greatest ideas in the world, but the market is not there, we're not going to be able to do very much. I think you touched on this in your testimony.

But what about the old Yankee peddler syndrome? You are captains of industry; do you think you are hustling and selling as well as you might be in these areas?

Dr. WEINIG. No, sir. It's easier to take the Concord than 15 hours to Tokyo. And I want to tell you something: I'm leaving for Tokyo this week, and I don't look forward to it with great excitement.

So what I'm really trying to say to you is it's tough over there. And I think as Yankee peddlers, it's always been easier for us to go to Europe prior to Japan.

In my own case, I had six subsidiaries in Europe before I opened my first in Japan. Now, that's bad. What we're really saying is it's a tough environment there. It's not just the traveling.

Senator CHAFEE. Well, I don't think we should concentrate only on Japan; how about Indonesia?

Mr. WEINIG. I don't even know where it is. [Laughter.]

I'm kidding. What I'm trying to say is, No, that's well beyond our ability, you see, because of what we do.

First of all, we're in high technology, and to go into Indonesia would be of no consequence at all to me. I only can go to those countries where they're making chips. I supply the chip manufacturers. Therefore, since they're not making chips in Indonesia, I would not go there.

May I digress a moment, Senator? I want to support this gentleman's statement, which I thought was very interesting, of being more supportive of productivity technology than mere basic R&D. I think we keep missing this point.

You know, in the industry we serve, electronics, when they were faced with productivity problems—in other words, competition got rough—they went offshore; they went to cheaper labor: to Indonesia, to the Philippines, to Singapore, OK? They didn't spend the money on improving their productivity in this country.

Now they are suddenly saying, "My goodness! We'd better bring back that technology and learn how to do it here, using robotics and automation, and trying to work on some of these problems."

This country has essentially shortchanged productivity technology—if there is such a phrase, but I think you know what I'm referring to. We need some emphasis there. It's where the Japanese have been devastating—their ability to produce a product, not necessarily to innovate it.

Senator CHAFEE. I thought we were considered to be very smart in this country. I thought we were whizzes on the assembly line, making innovative developments. I don't see how the Federal Government can get into this productivity business.

Mr. WISNOSKY. We were whizzes back in the days when the only thing that was important was how efficient a process was done. But when you talk about the factory of the future, where you are talking about not only being efficient but being very flexible to meet the changing demands of the marketplace, and being very effective, which means things such as the kan-ban or just-in-time way of materials handling, you are talking about a whole different ballgame.

In the first case, for flexibility, you are talking about robots, and we don't have any kind of a national program in robots. There are about 54 robot companies, and the biggest one was just bought out by a bigger company because, I believe, they could not get financing to grow and to meet foreign competition.

Senator CHAFEE. What good are all these business schools? Don't they teach people to be productivity whizzes?

Dr. WEINIG. Are you seeking a serious answer, sir?

Senator CHAFEE. Yes.

Dr. WEINIG. They are not very good.

Senator CHAFEE. Don't they spend all their time on finance, mergers, and acquisitions?

Mr. WELLINGTON. Yes.

Mr. WISNOSKY. And they give that part of it very well.

Senator CHAFEE. How many of you went to business school?

Mr. WELLINGTON. I went to engineering school and then to business school.

Senator CHAFEE. How many have engineering degrees?

[Showing of hands.]

Senator CHAFEE. All right.

Mr. WELLINGTON. But I must confess to having also gone to a business school afterwards. [Laughter.]

Senator CHAFEE. I'm going to give you a choice.

Would you prefer a general reduction in the corporate tax—one choice—or further changes in specific credits, such as more rapid depreciation, R&D credit, investment tax, ITC, or something like that?

How many of you would prefer a reduction in the corporate tax? [Showing of hands.]

Senator CHAFEE. Well, that settles that. [Laughter.]

Gentlemen, thank you very much for coming. I appreciate it. One more question: Why did you vote for the cut in the corporate tax?

Dr. WEINIG. Oh, I believe it's a simple and direct way to do business and acquire a thing correctly. I think all the rest sort of becomes gamesmanship, and they tie up our accounting departments and our planning departments. It's the cleanest way to do it, and it's the fairest way, sir.

May I add? A reduction in corporate taxes and a minimum corporate tax.

Senator CHAFEE. Well, a minimum corporate tax is a very, very complicated issue.

Do you agree, Mr. Wisnosky?

Mr. WISNOSKY. I agree that the rest of the things that we have done, and particularly, messing around with small paragraphs 1 year and changing that paragraph the next year gets us no place. We must make a big change, and stick with it.

Senator CHAFEE. All right.

Mr. Wellington?

Mr. WELLINGTON. The main thrust of my testimony was the elimination of the corporate income tax. Yes, in the right direction.

Senator CHAFEE. Thank you, gentlemen, very much.

[The prepared statement of Mr. Wisnosky follows:]

STATEMENT OF DENNIS E. WISNOSKY

"POLICIES TO PROMOTE THE GROWTH
OF U.S. TECHNOLOGY-BASED INDUSTRIES"

Good Morning, Senator.

I appreciate the opportunity to address this important committee and to help you explore ways in which government, industry, labor and the academic community can create an environment in which our new technology-based industries can grow.

For the past 15 years, I have worked in government and private industry in positions where my principal concerns have been advanced technologies and factory automation.

First, why should we even be concerned with the growth of technology-based industries? It is vital, I believe, because these high-tech businesses represent the future survival of the U.S. economy. Let me explain.

Two phenomena are present today which are changing the very substance of the U.S. - and world - economy: one, America is becoming an information-based society. For the first time, more than half of our GNP is being generated by service - not manufacturing - industries; two, today where we still have manufacturing left, we compete in a global marketplace. U.S. corporations are no longer just competing with companies. We are competing with entire countries and even combinations of countries. These global markets are technology driven and that technology is fostered in high technology businesses.

In order for the U.S. to survive and prosper in this new environment, if we wish to maintain our personal standard of living and our position in world, we must effectively exploit the new technologies. This can only be done by providing a constructive U.S. environment within which both entrepreneurs can invent and bring products to market and potential users can clearly see the way to afford their initial implementation.

Today I will offer five recommendations for utilizing existing laws and enacting future legislation to facilitate America's transition to an information-based society - a society in which high-technology industries will become the engine to drive the U.S. economy.

RECOMMENDATION ONE: INCREASE R&D FUNDING

Because that technology engine is fueled by R&D, my first recommendation is to enact legislation that will increase government support of federal and private research.

Now, I know that you have heard all of this in general before, however, my viewpoint is that of productivity enhancing R&D, not only basic sciences; and I believe that the message deserves repeating.

Short-sighted federal government policies have placed our high-technology industries at a disadvantage. The fiscal 1983 budget reduces non-defense R&D funding 20 percent below the 1981 level. A report by the American Academy for the Advancement of Science projects an additional 25 percent drop in federal financial support for R&D, by 1987.

It has also been forecasted by Battelle Columbus Laboratories that American expenditures for R&D will only increase 8.2 percent in 1983, compared to 1982. Meanwhile, our competitor's R&D accelerates. Japanese manufacturers, who receive far more support from their government than we do, are planning to increase their expenditures by a full 13 percent! France also attaches importance to R&D in their new national industrial policy. Their non-defense research and development budget is scheduled to be increased by 17.8 percent, annually. In fact,

the French Government is investing \$350 million in R&D and venture capital over the next three years in factory automation and robotics technology alone.

Foreign national R&D aid programs also have an effect on international R&D joint development projects. For example, Siemens AG of West Germany and Philips of Holland have just signed an agreement for long-term cooperation in R&D in a number of high technology areas. R&D money was available for the project from both of their respective governments.

All in all the slowdown in U.S. R&D in the late seventies is estimated to have caused a reduction in U.S. productivity of 0.2 to 0.4 percentage points. These countries R&D programs also typically link both private industry and academic institutions. Here the National Science Foundation has made a valiant effort, but in Factory Automation R&D this has amounted to only about \$3 million/year. When we ask if we can afford increased R&D, we should also ask if we can afford decreased productivity.

RECOMMENDATION TWO: STABILIZE POLICIES

In addition to channeling more funds into high-technology R&D programs, we need to establish more stable federal government support policies. A good example is the Army Manufacturing Technology (ManTech) program.

On November 8, 1982, an article in Metalworking News indicated that the Pentagon's Manufacturing Technology (ManTech) funding for the next 5 years would probably total \$1.6 billion. A month later, on December 6, it was announced that the House Defense Appropriations subcommittee had removed the entire \$120 million Army ManTech program from the fiscal 1983 budget. Then on December 27, it was announced that a joint House-Senate

conference had restored \$50 million in research and development money for the Army ManTech program.

Since ManTech programs have been described as the "backbone" of our efforts to modernize our defense industrial base with state-of-the-art technology, this on-again, off-again approach to legislation hardly seems appropriate. It would be tragic if we had to rely on World War II machine tools and out-dated manufacturing methods to supply our forces in the NEW ACTION ARMY! Let me also remind you that the DoD Mantech Program which congress so seemingly lightly treats is the same one that gave the country such advances as composite materials, titanium materials for jet engines, NC machine tools and the Air Force ICAM Program which now serves as the CAD/CAM systems standard for U.S. Industry. And that all of this money is spent in the private sector.

It has been estimated that U.S. manufacturers have been producing 58% of their R&D in-house and purchasing 42% from outside firms. The return on this research -- in terms of cost reduction and profit -- is 70-100 percent. This is great, but how can these firms -- even with such potential -- maintain the necessary momentum with our on-again off-again R&D incentive programs.

Our attempts at a productivity program also illustrate a lack of continuity. Three different federal programs have been initiated in the past 10 years: Nixon had the National Center on Productivity and Quality of Working Life, or NCOP. Carter abolished that and after a year started the Department of Commerce COGENT, Cooperative Generic Technology, program. That was abolished by President Reagan's administration and then the Productivity Counsel was started. Clearly, none of these programs had enough momentum to get a national productivity

policy off of "square one". The essence of this is that the U.S. needs a national industrial strategy. At this point almost any one that we pick would be superior to where we are now. Once we have this, then we must stick with it long enough to make a difference.

RECOMMENDATION THREE: REVAMP ANTITRUST LEGISLATION

There are, of course, many other areas where stable federal government policies are critically important to forward planning and capital investment in the new technologies. One is antitrust legislation.

For example, the government's guidelines for joint ventures in R&D provide that "Industry-wide research projects that include many or all firms in a line of commerce, as well as projects involving the dominant firm or firms in an industry, pose antitrust concerns. These are more likely to restrain competition in innovation than more limited projects involving a few firms with lesser market shares."

The "rule of thumb" is that the fewer companies that are involved, the less likely is the chance of a violation of the antitrust laws.

I suggest that the "rule of law" is better than the "rule of thumb."

Recently, 15 companies in the computer and microchip manufacturing industries, joined together to set up a for-profit joint venture. The company, called Microelectronics & Computer Technology Corporation (or MCT), will sponsor and conduct research in computer-related technologies.

It was encouraging to see the Justice Department give MCT the green light. It will help assure that the U.S., which is already 5 to 10 years behind Japan in factory automation, will not fall further behind.

But it's not enough. We should enact new legislation to authorize more companies to set up joint ventures for R&D. We should be helping the strongest companies cooperate to compete in the global marketplace with the cartels already set up by our offshore trading partners, such as England, France, West Germany and Japan.

We have to ask ourselves where the greater risk lies . . . in domestic competition between U.S. companies? . . . Or global competition, at home and abroad, with multinational, multigovernmental megacorporations?

RECOMMENDATION FOUR: ENCOURAGE LONG-TERM INVESTMENT

Another area where congressional action is called for is to provide a stable financial environment that facilitates and encourages long-term capital investment.

Most U.S. financial executives insist on a 12 to 24 month payback for capital expenditures. But today's factory automation systems may require 5 years or more for payback.

The problem is that the financial executives, most of whom are struggling with cash-flow problems, are borrowing short-term money at a couple of points above the prime rate to finance their capital expenditures. Traditionally, American industry has financed capital improvements with long-term money -- 20-30 year bonds at interest rates of 4 or 5 percent. And

the risks involved in borrowing for 20 years at double-digit rates are simply too great to accept.

So, somehow, government policy must be adjusted to provide long-term, low-interest money to technology-based, growth industries. Other countries have aided investments in a variety of ways.

It might be constructive to examine the financial advantages that the typical Japanese manufacturer enjoys. If the Japanese corporate manager needs long-term credit, he naturally will consider going to the Long-Term Credit Bank of Japan, Ltd., which was created by the L.T.C.B. Law, 30 years ago!

In 1974, this bank ran an ad in the The Wall Street Journal that stated that 136 of Japan's 200 largest corporations were their customers, that their assets were \$16.5 billion and that their current loans amounted to \$11.7 billion. And there are two more government-chartered long-term credit banks in Japan, if this one turns down his loan.

All of the financial rules of the Japanese manufacturing game are different. They have a lower cost of funds, currently averaging around 8 1/2 percent for short-term money. They are more highly leveraged, with assets-to-equity ratios approaching six to one, versus the two-to-one ratio prevalent in the United States. And they accept a 5 percent pretax return on sales, which the American business could not even consider.

The Japanese capital markets are probably the best in the world, today, because of the high savings rate of Japanese families. The typical family in Japan saves 20 percent of household income, versus 6.5 in the United States.

And when a small businessman in key technologies, such as microelectronics, robotics, computers and peripherals, biotechnology and fiber optics needs venture capital, Japan's Ministry of International Trade & Industry (MITI) is there to guarantee up to 80 percent of a \$400,000 low-interest, long-term bank loan.

If you want to buy robots in the United States, you borrow money for 2 years at 14 percent. But, a Japanese manufacturer can get a 10-year, 3-percent-interest loan to buy robots, through The Japan Robot Leasing Co. In England, a manufacturer can get a government grant for 33-1/3 percent of the robot's cost and depreciate the remaining 66-2/3 percent in the first year.

What can Congress do to help U.S. firms in need of venture capital?

First, you can take steps to end the destructive monetarist economic experiment of the last 3 years. As French President Mitterand pointed out recently, real interest rates in the United States are still 5 percentage points above historic norms, because of the disastrous policies of the Federal Reserve Bank. We must get this real interest rate down into the 0 to 2 percent range.

Secondly, I think we should set up a "Federal Technology Development Bank" to provide long-term, low-interest, venture capital funds to high-technology growth start-ups.

The Federal Technology Development Bank should be politically independent. It could be capitalized entirely through the issuance of federally guaranteed tax-free bonds. It would guarantee up to 80 percent of loans made by private banks to sunrise corporations.

These sunrise industries would include: computers, telecommunications, microelectronics, computer-integrated manufacturing systems, robotics, biotechnology, aircraft and composite materials.

If England, France, Belgium, Japan and even Holland can arrange such financing for their "sunrise" industries, why can't we?

For those who say that such financing is not necessary because of the ample supply of venture capital in this country, I would like to point out what is happening in one of our key, high-technology sunrise industries -- robotics.

Something like 30 to 40 robot manufacturing companies have been started in the United States in the past 5 years. Without exception, every one of them has a cash flow problem and needs capital -- either for growth or survival. As a result, the majority of them are being acquired by larger companies.

Even the largest of our robot manufacturers -- Unimation -- was first acquired by Condec and, most recently was acquired by Westinghouse.

It is important to remember that when you enter a high-technology market you are attacking a moving target. If you do not have the capital to finance R&D, marketing and distribution, you get left behind. The little fish get swallowed up by the big fish. And, as you know, acquisitions and mergers inevitably result in less innovation and the loss of jobs.

RECOMMENDATION FIVE: ENCOURAGE SKILLED LABOR

In addition to a stable investment environment, R&D and capital, our sunrise industries need qualified, highly skilled workers and technological specialists. And our educational system is not providing an adequate supply.

Again, it is useful to compare what the Japanese are doing to what we are doing. Japanese children go to school 240 days per year, while American children attend school only 180 days annually. Japanese high school students take 6 years of math and science, including a year of calculus. Here, only 1 out of 3 U.S. high schools offer more than 1 year of math or science.

The Soviet Union is also betting heavily on scientific education. The typical graduate of a Soviet high school will have completed 2 years of solid geometry, 2 years of calculus, 5 years of biology, 5 years of physics(!) and 1 year of astronomy.

Japan, with less than half of our population graduates twice the number of engineers that we do. And the Soviet Union turns out 5 times as many graduate engineers as the United States does. The American Electronics Association projects that, in 1985, the electronics industry will need 51,000 engineers, but that our colleges will be graduating only 15,000.

One of the reasons the United States is headed for a shortage of scientist, computer specialists and engineers is that there are not enough teachers. For example, at the university level, 15 to 40 percent of the new job openings for engineering professors each year go unfilled. Instead of going on to graduate school and getting PhDs, engineers, math and computer science graduates are taking jobs in industry, where their starting salaries are 50 to 100 percent higher.

Both business and government are going to have to channel funds into math, science and engineering education. In the 1960s, about 30 percent of the National Science Foundation's budget was allocated to science and engineering education. Currently the figure stands at only 2 percent. This is not just unwise ... it is dangerous, from an economic, military and social standpoint.

The primary reason why the United States is now the No. 1 grain producing nation in the world is that we established a coalition between the Department of Agriculture, its Extension offices, state universities and the farmers back in the thirties.

I propose a similar coalition between the Department of Commerce, the colleges and universities and technology-based growth industries. By enacting legislation which will provide adequate capital and tax incentives, you can create an environment where this can be accomplished.

In conclusion, enacting legislation which follows these recommendations will create a stable economic environment for R&D and capital investment - an environment which will promote high-tech and high-growth industries and spark U.S. competitiveness abroad.

Thank you.

Senator CHAFEE. We will now hear from Dr. Boskin and Dr. Kendrick.

Dr. Boskin, why don't you go first?

STATEMENT OF DR. MICHAEL BOSKIN, RESEARCH ASSOCIATE, NATIONAL BUREAU OF ECONOMIC RESEARCH, CAMBRIDGE, MASS., AND PROFESSOR OF ECONOMICS, STANFORD UNIVERSITY, STANFORD, CALIF.

Dr. BOSKIN. Thank you, Senator Chafee. It's a pleasure to be here, and I will summarize my remarks. I have also prepared a one-page summary of the major points, in addition to the complete written record, for your use.

Let me just start this brief summary by saying that I strongly believe that there is a very important link between the generation of new technology, innovation of products and processes, and our overall rate of investment.

While this is something of a controversy within the economics profession, if either there is a substantial amount of what economists call learning by doing, that is, in the course of undergoing new investment, new processes and products become apparent or easier to generate than they would have been, our very low investment rates in this country are a part of the reason for the apparent or possible decline in our rate of technological change. And one way to go about increasing our long-term growth rate not only would be to deal with technology directly but also to increase our rate of capital formation.

The same could also be said for the second key potential link between technology and innovation and investment; that is, the fact that for many types of technologies it is prohibitively expensive to embody a new technology either in the old capital a firm possesses or in the old human capital, the knowledge and skills of its labor force, and, therefore, the new technology tends to get embodied either in new capital, the new investment, or in the new human capital, its new workers or the retraining of the existing workers.

With that in mind, then, let me say that I think it is important to point out, relative to some things that were said previously this morning, that I believe the single biggest impediment to our long-term growth, the generation of new technology, has been the tax system of the United States, and more recently the tax system and the budget deficits.

The tax system, I believe, in the 1970's was important because the interaction of inflation and the tax system caused effective tax rates on investment to skyrocket and effective rates of return to decline.

More recently, in the 1981 act as amended in 1982, there were some very important improvements made. While they were far from perfect—ACRS as amended and the changes in the investment credits and a variety of other things—they created a situation where the size of this tax wedge was reduced substantially. In some cases it was even made negative, but it certainly was reduced substantially on average.

That was the good news. The bad news, unfortunately, was that we couldn't afford all of the good news, and our budget deficits cur-

rently, adjusted for inflation, are enormous. And the increased before-tax cost of capital caused by a confluence of monetary and fiscal policy has more than offset the potential beneficial effects of the structural changes in the tax laws that were undertaken in 1981 and 1982; and hence, we continually have a low rate of capital formation.

I believe that those changes in the tax law, including, for example, those on the personal side in the reduction of the rates and the adoption of the universal IRA account which, Senator, I know you played a leading role in, are likely to increase our saving rate and our rate of investment in the long run, as we come out of the recession, as we get our deficits under control, and people become convinced that we will not reflate at anything like the levels of the late 1970's.

That is going to take some time, and it is going to take some doing; but I think the single best thing we could do to generate more technology in the immediate future would be to lower the cost of capital.

This was mentioned by several people this morning: While the venture capital industry has been given a boost by the reduction in capital gains taxes, once these firms were started up they had an immense problem in the cost of capital they faced.

The gentleman immediately prior to me suggested there was a 21-percent cost a couple of years ago, and that was both high historically and high relative to rates in Japan and elsewhere.

The single most important thing we could do to deal with that would be to lower the amount of Government dissaving, the substantial rate of Government deficits projected for the next several years.

Government also changed the composition of its——

Senator CHAFEE. What do you say to the answer that they frequently give, that the government deficit in Japan is actually greater than ours?

Dr. BOSKIN. Sir, that's correct as a fraction of the gross national product, but the Japanese saving rate is more than twice the American saving rate; so the government is pulling out of the funds available for private investment a far smaller fraction of the total available supply of funds than it is here.

Senator CHAFEE. Let me add, Dr. Boskin, that you helped a lot on the IRA, and we appreciate that.

Dr. BOSKIN. I appreciate being asked and the role you played, Senator.

Senator CHAFEE. Well, we did do some good.

The suggestion was given yesterday that IRA funds can't be used for venture capital. Is that so?

Dr. BOSKIN. As I understand it, there are restrictions only with respect to the holding period and to taking the funds out. I am not aware of specific restrictions concerning venture capital.

Senator CHAFEE. It seems to me if you have a trustee like a bank, and the bank then puts it into some venture, I didn't know that was prohibited.

Dr. BOSKIN. I think you are quite correct, Senator. I think, so long as whatever financial intermediary is involved takes some fraction of their portfolio and puts it in a startup of a high tech

firm, for example, or a share of a venture capital issue, that will be reflected in the return you get on your IRA.

I think that perhaps the person was referring to the prudent man rule which is often used by trustees in fulfilling their fiduciary responsibilities. But I know of no explicit prohibition of that sort.

Now, that will get me to a couple of other points I would like to make; that is, I think the structural changes in the tax law were important and were sensible, I think, complemented by a better ability to get spending under control. And also, in all fairness both to the Congress and the administration, the size of the tax cuts became much larger because inflation fell much more rapidly than expected. So, on an inflation-adjusted amount, the size of the tax cut was much larger than originally anticipated. Therefore, I think the size of the deficits could not have perfectly been anticipated—the amount of bracket creep decreased substantially, and things of that sort.

But I think from the standpoint of getting beyond the initial startup of a small firm and generating investment and R&D expenditures outside of the venture capital area, which is only a modest, albeit vital, part of the several hundred billion dollars of investment in the United States, getting—the second stage, as was mentioned earlier this morning—getting existing firms in important industries in health research and pharmaceuticals et cetera, to invest and to spend on R&D, I think that getting the before-tax cost of capital back under control is probably the single most important thing to do.

I do not think that it makes sense for the Government to try to get in the business—as you suggested yourself, sir—of outguessing the private marketplace item-by-item. I do not think we need a reindustrialization bureau that will say that this particular group or that particular group should get Government funds or Government support. I think our major problem is that the Government is absorbing too much of the private capital available for investment.

Also, that's complemented by the sharp reduction in Government investment per se. While we have a defense buildup going on, throughout the late 1970's the share of Government investment in GNP fell substantially.

There are a variety of problems associated with that, but one place to start might be for the Government to do a better job of bookkeeping itself and have a separate capital account so we can get an idea of when we have periods of rapid increases in Government investment or rapid decreases in Government investment.

Senator CHAFEE. Government investment is what we call capital expenditure?

Dr. BOSKIN. Yes.

Senator CHAFEE. Is building an aircraft carrier a capital expenditure?

Dr. BOSKIN. Yes.

Senator CHAFEE. Is building a Senate Office Building?

Dr. BOSKIN. Yes.

Now, one could argue about the potential return.

Senator CHAFEE. As opposed to food stamps?

Dr. BOSKIN. Right. Or lettuce for the White House kitchen. [Laughter.]

It is important to point out, sir, that whatever the particular feelings are about the rate of return on our New Senate Office Building and on a particular weapons system, that many types of Government investment are complementary to the private sector—providing transportation improvements were very important in the sixties; railroad developments increased our rate of growth in the 19th century.

Now, what I am getting at is, Government has a role to play in its own direct investment. Many types of investments will not be undertaken by the private sector because the returns to them are not fully appropriable.

As was mentioned earlier, basic research is a very, very important item in that particular area.

I would also argue that the deficits, which I pointed out, are a problem in our high interest rates and cost of capital, are a partial cause of the overvalued dollar, which is causing us so much anguish in our foreign competition, that we are importing an enormous amount of foreign capital with our high interest rates, which is keeping the dollar propped up relative to its historic or purchasing-power parity, and, therefore, our exports are having a tremendously difficult time overseas, and imports are much cheaper here.

It is important to get the deficits under control to restore foreign competition for our own manufactured exports.

I personally do not believe that a comprehensive, in the planning sense and budgetary sense, industrial policy makes sense in the United States, and I think that the actions of thousands of financial intermediaries and millions of private investors is likely to do better. But in a few well-chosen areas, the Government has to play the leadership role. Those are in generation of basic research, in generation of investment that can only be undertaken because of the lack of appropriability—so it's like infrastructure, roads, transportation, things of that sort—and basic knowledge, that the private sector cannot play the leadership role in financing investment.

I believe, as important as the development of new technology, is its dissemination. That is, a new idea doesn't do us much good, or a new technology doesn't do us much good, if it isn't used, if it isn't adopted.

We were talking about increasing our productivity. If we cannot get office workers to adopt new office equipment, for example, the fact that the technology is available won't be of much use. That reflects both our incentives to make private equipment purchases for private investment purposes, and it also reflects a variety of aspects of the definition of research and development, of the definition for accounting purposes in our tax laws what R&D consists of. About two-thirds of R&D is the D—the Development part.

There are a variety of issues that we could go into, which I won't elaborate here, about where we ought to draw the line in commercialization of a product, especially when you get to high technology areas where the rate of innovation is so rapid it doesn't pay people to patent; that is, you have to get out there so fast, and this new idea is going to be obsolete so rapidly, that there is a continual turnover in 6-month, or year, or 18-month cycles. And, in that sort

of an environment where you won't have patent protections so that you can privately appropriate the returns, I believe we are going to have to pay a little more attention to the role of Government and to how we define our research and development expenditures.

I believe that the extra R&D tax credit is justifiable, on the grounds I just mentioned; although I wouldn't go much further in that particular regard.

I would reiterate two basic policy recommendations: one is to get Government deficits under control. I know that's easy to say and difficult to do, it's probably the single most important thing we can do to generate more investment and greater technological change in our country.

The second thing, following up on the universality of IRA accounts, is to move a little further in that direction.

If one looked into the future, and we were out of a situation where we had precarious deficits and we had a very sluggish economy, one could conceive of a tax system which fully integrated the corporate and personal tax and changed the base by allowing an IRA-type deduction for all saving, rather than limit it to the \$2,000 done for retirement, that had as a tax base some comprehensive measure of personal consumption. We could have that tax be levied with progressive rates like in the current law and exemptions and deductions in it—I happen to favor that as opposed to a value-added type of consumption tax.

But those types of movements or moving toward that by increasing the limits on IRA's and things of that sort will, in my opinion, further reduce the tax wedge to saving and investment and generate more capital for our investment in general. And, as a first approximation, when it is most productive for that investment to go into high technology uses, the private marketplace will make sure that it does.

Thank you.

Senator CHAFFEE. Thank you very much, Dr. Boskin. I understand that the administration is now proposing something similar to our original IRA proposal for education.

Dr. Kendrick, we're glad you're here and look forward to your testimony.

STATEMENT OF DR. JOHN W. KENDRICK, PROFESSOR, DEPARTMENT OF ECONOMICS, GEORGE WASHINGTON UNIVERSITY, WASHINGTON, D.C.

Dr. KENDRICK. Thank you. I'm glad to be back before this subcommittee again, after 6 or 8 years. The last time I was here, I believe Senator Bentsen was chairing it, or it was another subcommittee, perhaps, of the Finance Committee.

At that time we were looking at tax and other measures to try to stimulate investment, innovation, and economic growth, in view of the slowdown which had occurred in the 1970's.

I was very pleased to see a gradual consensus emerge in the latter 1970's as to the kind of measures which could stimulate saving, investment, innovation, and productivity, and I think it really helped to set the background for the passage of the Economic Recovery Tax Act in 1981.

The trouble is that the favorable impacts of the provisions of ERTA have been obscured by the economic contraction that we have been going through. However, my own view is that we are now in the process of coming out of that contraction, and very shortly, with recovery, we will see the usual concomitant increases in saving, investment, and also, I think, very definitely in productivity as well.

I would like, if I could, to place on the record in addition to my prepared statement, an article I wrote for the January 1983 AEI Economist, discussing the outlook for productivity and growth, so that I can skip over that part of the testimony.

Senator CHAFEE. Certainly.

I'm glad to read your statement "I foresee a robust expansion in 1983 and 1984." That's good news.

Dr. KENDRICK. Yes. That is not the consensus, but I foresee it because I think we are going to have strong productivity growth partly because of the turnaround in real R&D some years ago, and also in part because of the provisions of ERTA which will help on the productivity front. That will help to hold down the increases in unit costs and prices and permit more of the increase in nominal GNP to be translated into real growth, which is what we need to gradually reduce unemployment.

However, I don't think it will be until 1987 or so before we reach relatively full employment. And then I think we can see whether the efforts to stimulate saving and investment have succeeded in raising those rates, and whether we have enough to meet the Nation's capital requirements.

My feeling is that we probably will need further stimulus to saving and investment, and I personally would like to see further reforms of the tax system to reduce the bias against saving and investment inherent in the income tax—the wedges that Prof. Boskin was talking about—with further shifts to consumption-type taxes.

Now, to hit just some of the highlights of the recommendations I have here:

First of all, I think it's very important that real R&D outlays continue to expand, including the federally funded R&D which has now been going up for several years, after sharp drops in the early 1970's.

Recent research by Terleckyj, Mansfield, and others, show that federally funded R&D, particularly when conducted in industry laboratories, does have a stimulative effect on private R&D projects and activity and leads to an increase in private R&D spending.

Senator CHAFEE. Did you say federally funded R&D in industry's laboratories?

Dr. KENDRICK. Yes, particularly when industry is performing the R&D, even though it is funded by the Federal Government.

Senator CHAFEE. Could you give me an example of that?

Dr. KENDRICK. Well, I think that most of Federal R&D is performed in industry.

Senator CHAFEE. Oh, you mean they will fund—

Dr. KENDRICK. Yes, contracts.

Senator CHAFEE [continuing]. An aircraft company? A certain amount of its research can be charged to the Government?

Dr. KENDRICK. Yes.

Senator CHAFFE. But it's not direct funding, is it? They don't say to United Technologies, "Here's some money. Do some research on materials for jet engines?"

Dr. KENDRICK. That's right for the applied R&D; it's through contract. Of course, the basic is funded by direct grants from NSF, which also feeds into company-funded applied R&D, but with a much longer lag.

But this research I am referring to indicates that the federally funded R&D does give private scientists and engineers ideas that they would like to pursue for the company's goals, and, therefore, I think the Federal funding does stimulate the privately funded R&D.

Also I think Federal procurement policy can be used to promote technological innovation and should be used to a greater extent than it has been to stimulate technological advance.

As far as private R&D is concerned, I had recommended the 25-percent incremental R&D tax credit in my appearance here in the 1970's. I'm happy it was passed. I think by 1985 we will have enough evidence to see whether it has done the job and should be renewed and perhaps expanded by making more of the R&D outlays eligible for the tax credit.

Like some of the witnesses, Mr. Packard in particular, I would like to see the Federal Government not merely tolerate joint R&D projects, but actively encourage them if they are in the national interest, as long as there is no collusion on prices and markets.

And, certainly, the idea of Secretary Baldrige, with respect to R&D limited partnerships, looks very attractive.

Another promising initiative has been the NSF program to establish joint industry-university centers for particular areas of applied science and technology. This helps to steer university research—some of it—in practical directions and accelerate the flow of findings to industry.

The NSF, I understand, is trying to assess the cost effectiveness of that program, and, if the finding is favorable, I think this type of program should be expanded, as envisaged in the Stevenson-Wydler Act of 1980.

Personally, I was somewhat sorry to see the Generic Technology Center idea dropped, which also was provided for in that act. A center had been created by the Department of Commerce before the end of the Carter administration. I think that was dropped out.

Incidentally, I think that some of those industrial innovation initiatives proposed by President Carter were quite constructive, and I was sorry to see some of them abandoned.

Now, will there be enough scientists and engineers to meet the growing demand, with economic recovery and, we hope, stimulation of innovation by ERTA and other measures?

There I don't think the answer is clearcut, and I would like to see some new long-range projections prepared by the Department of Labor and NSF to see what shortages there may be, assuming reasonably strong economic growth.

If there are shortages developing, then expanded financial assistance to students in these disciplines of science and engineering would be in order. And even though I'm a great believer in the market system, when there are long lags between a change in

demand and supply, as in the case of educated people, then I think projections can be quite helpful in trying to anticipate the signals of the market.

I certainly favor training of displaced workers, and I would like to see Federal training programs strengthened. I don't think it's fair to put all of the burden of disemployment on those who are affected by technological change through no fault of their own.

In a high level economy, of course, it pays industry to hire these people and train them; but also, I think it speeds up the process to have governmental support for worker training and retraining programs.

Another area I think is quite legitimate for the Government to engage in, to stimulate invention, is the collection and dissemination of commercial and technological information.

I think the Departments of State and Commerce could do a better job of getting out much of the information that they gather.

I gather that the new Office of Productivity, Technology, and Innovation in the Commerce Department is trying to increase the work of the Patent and Trademark Office in that regard. Also the National Technical Information Service capabilities are being beefed up, particularly with respect to information about foreign technologies—and that I would like to stress.

With other countries catching up with us technologically in more industries and areas, we should do more to try to gather and disseminate information about the technologies generated abroad.

Some businessmen advocate lengthening the patent period of protection from 17 to 20 years, as in Great Britain. That's a very complicated subject, with respect to patent laws, and I would rather not express an opinion about that, except that they do have a point that, with increased regulations of the last decade and more, it takes longer to develop commercial exploitation of the inventions that are patented, so perhaps that is a reason; although we are hoping now that burdens of regulation are being reduced.

As to favoring small technology-based companies, I think there is a good case for that in the infant industries type argument. However, I think the interests of those smaller companies are being well represented by the Small Business Administration, that has lots of ideas as to how to further stimulate small, growing business.

My final point is, I agree with Professor Boskin in not favoring pinpointed industrial policies designed to promote selected industries or types of technology, except to the extent that Federal procurement obviously does provide some direction with respect to industrial and technological development.

But as far as civilian markets are concerned, I don't think that Government officials have any keener vision of the waves of the future than do the executives who run and finance the enterprises that respond to market demand.

Thank you.

Senator CHAFEE. Well, thank you very much.

[The prepared statements of the previous panel as well as Dr. Kendrick's article for the January 1983 AEI Economist follow:]

GOVERNMENT POLICY, TECHNOLOGY & ECONOMIC GROWTH

by

Michael J. Boskin

At what I hope is the trough of the current substantial recession, it is tempting to focus almost exclusively on our short-run economic problems. However, we face an even more insidious danger to our economic and social well-being: our sluggish rate of real economic growth over the last decade and the possibility that our growth rate may continue at very low levels. Put simply, our growth performance in recent years has been simply abysmal, both by our own historical standards and relative to that of other advanced economies. Since the early 1970's, our rate of per capita real GNP growth has slowed markedly to less than half of its previous post-World War II level. As Table 1 indicates, the decline in labor productivity, measured from business cycle peak to business cycle peak, has been even more dramatic.

While the exact causes of our sluggish growth are subject to dispute, I believe the following general picture summarizes our problem: we have not been adding enough capital to our capital stock; we have not been generating enough new technology and embodying it in that capital stock and our labor force; we have adopted or continued government policies which impede our ability to generate new technology and net investment and thereby enhance labor productivity. All this has occurred against the backdrop of major structural changes in our economy: a shift in output away from manufacturing toward services; a changing age, experience, and occupation mix of the labor force; etc.

Table 1

Average Annual Increase in Labor Productivity,
Private Business Sector, Post-war Period, Between Cycle Peaks

Period	Increase in Productivity
1948-53	3.6%
1953-57	2.4
1957-60	2.4
1960-69	3.1
1969-73	2.3
1973-79	0.6

It will not be surprising, then, if I argue for policies designed to increase, or as Senator Chafee stated so perceptively in his announcement of these Hearings, "avoid hindering", the growth process.

Tables 2-4 document the decline in our investment and innovation. As Table 2 demonstrates, our rate of net private investment declined sharply over the last fifteen years (and has fallen even further in this recession). This low share of our productive investment in GNP occurred simultaneously with a drop in the share of GNP devoted to research and development expenditures. This is documented in Table 3. Further, the number of new patents issued, especially to Americans, has been falling, as documented in Table 4.

These trends were precisely what various tax reforms in 1981 were designed to overcome. I will return in a moment to why they have not been able to do so.

Before doing so, it is worth stating a few general principles concerning government intervention in the marketplace in order to promote or curtail various activities. While on occasion there are circumstances in which specifically targetted subsidies or incentives are warranted, such situations are bound to be the exception rather than the rule. I cannot emphasize too strongly that our problem is a general lack of capital formation and technological innovation, not low rates of capital formation in specific industries. That is, in all but rare circumstances, we would expect the private capital market to channel the available supply of investment funds to those investments which were expected to be most productive. It would be naive to assume, however noble it might sound, that a re-industrialization agency, or Congress itself, could in general do a better job in allocating our scarce supply of capital among the many competing investment opportunities than could millions of private investors and thousands of financial intermediaries

Table 2

Quinquennial Averages of Investment Rates

Period	Share of Net Productive Investment in GNP ^a
1965-69	4.1%
1970-74	3.1%
1975-79	2.2%

^a Subtracting direct pollution control expenditures from investment.

Source: Summers, L.H., "Taxation and Capital Investment: A q-Theory Approach," Brookings Papers on Economic Activity, 1:1981.

Table 3

Resources Devoted to Research and Development

Year	R&D Expenditures as Share of GNP
1965	2.9%
1969	2.7
1973	2.3
1978	2.2

Source: U.S. Statistical Abstract, 1981

Table 4

Patents Issued (in thousands)

Year	Individuals	U.S. Corporations	Foreign Corporations	Foreign Residents
1973	16.9	38.6	16.5	22.6
1974	18.0	37.8	18.7	25.6
1975	17.2	34.6	18.3	25.4
1976	14.0	34.4	19.9	26.0
1977	14.0	31.5	18.2	23.9
1978	14.3	31.3	19.3	25.1

Source: Statistical Abstract of the U.S., 1981

freely competing among themselves. The first principle to be adopted -- and abandoned only when compelling circumstances warrant -- is that economic policy with respect to capital formation, investment, saving, and innovation should be neutral with respect to the decision to save or spend, as well as with respect to type of investment, (e.g., by industry, location, etc.).

With this in mind, it is important to point out that our current set of policies is by no means neutral with respect to investment decisions. While the general erosion of incentives to save and invest caused by high inflation, the double taxation of investment income, and high and rising marginal tax rates in the 1970's has been partly redressed by the Economic Recovery and Tax Act of 1981, as amended in 1982 with the Tax Equity and Fiscal Responsibility Act, these basic reforms were accompanied by two unforeseen developments: first, and perhaps least important in the short-run, is that the adoption of the accelerated cost recovery system continued a situation where effective marginal tax rates on different types of investment varied markedly. While these two reforms were certainly, in a structural sense, a major improvement over what preceded them, they still leave us with a tax system which is far from neutral with respect to type of investment. Table 5, adapted from the Economic Report of the President of 1982, documents the wide range in effective marginal tax rates by comparing the before-tax return required to yield a given after-tax return for different types of capital. As can be inferred from the Table, the original 1981 Act not only created a wide range of rates, but lowered the eventual effective marginal tax rates to a point where uneconomic investment decisions would be made, i.e., the before-tax rate of return was lower than the after-tax rate of return. Much of this was amended in the structural revisions in the 1982 Act.

Table 5

Real Before Tax Return Required
To Yield a 4 Percent Real After-tax Return in 1986
(assumes 5 percent inflation)

Type of Capital	Rate
Construction Machinery	2.3
General Industrial Equipment	2.7
Trucks, Buses, Trailers	2.5
Industrial Buildings	6.4
Commercial Buildings	6.1

Source: 1982 Economic Report of the President

Second, and more important with respect to the availability and supply of capital and to the nature of the risks involved in the investment and innovation process, have been the dramatic increase in real interest rates, which, of course, is part of the reason for our sustained recession. Put simply, while we dramatically, if imperfectly, reduced the tax wedge in the investment decision, overall fiscal and monetary policy created a situation where the before-tax cost of capital rose dramatically and this has more than offset the potentially powerful incentives -- or more accurately, the removal of the substantial disincentives -- via the new tax law.

Thinking About Optimal National Saving and Investment

There are a variety of both common sense and technical ways to explain why we may be under-saving in the United States. Indeed, I have contributed such studies elsewhere. Let me give two lines of reasoning in the context of the current debate, and therefore, raise a variety of potentially important issues. Recall that I am averaging over economic fluctuations and taking a longer-term perspective. In this context the opportunity cost of a little bit more saving is roughly measured by the inflation adjusted after-tax return to savers. While this has increased slightly somewhat in the last two years, historically this number was on the order of 2% at most. The potential return from foregoing a little consumption, generating a little extra saving and investing it from society's point of view, is the gross of tax rate of return at the margin on investment. Numerous studies have attempted to estimate this number; my own suggest that it is about 7 to 8% averaged over long periods of time. If the corporate sector alone were under

consideration, the number would be slightly higher because of the extra tax wedge due to the separate corporate tax. Thus, the wedge driven between the net return to savers and the gross return to society from investment by our taxes on capital income is a measure of the incremental value to society of a small increment in saving and investment. This wedge is quite large; and any modest response of saving and investment to rates of return suggest that the misallocation of resources has a substantial cost (see Boskin, Feldstein, or Summers).

With perfect capital markets and the absence of taxes, consumers save to the point where their subjective time discount rate, ρ , equals the rate of interest, i , which in turn equals the marginal product of capital. Taxes on capital income reduce the net return to savers well below the marginal product of capital. Both the deadweight loss and the shortfall below the optimal saving rate are increasing functions of the interest elasticities of saving and investment. For the U.S. economy, if investment demand were quite elastic, even a modest interest elasticity of private saving of 0.3 or 0.4 would imply that our saving rate is only half of its optimal level!

I have elsewhere detailed a more rigorous approach to the issue of optimal saving (see Boskin, 1981). While the analysis is somewhat more technical than can be presented here, the optimal saving rate at any given time, s_t , depends on the difference between the gross return to capital and the net rate of return in the steady state. It also depends upon the rate at which the marginal utility of income declines, the rate of technological progress and population growth, and various characteristics of production technology. My estimates, which suggests the net saving rate in the United States runs about 7%, implies that for various reasonable estimates of the relevant

parameters the optimal saving rate is considerably above this level, perhaps twice our current net national saving rate. We would either have to believe in an enormous pure rate of time preference or a very rapidly declining marginal utility of income to render our current rate of capital formation socially optimal. Why is our rate of saving so low? There are a variety of possible answers to the question, but my own rough judgement suggests that the heavy taxation of capital income played a role, as has government dissaving in a variety of forms; finally, social insurance programs may have had some impact.

Beyond the simple deadweight loss kinds of calculations, there can be substantial first-order income effects from a depressed saving rate. Consider, for example, a closed economy or an open economy which must rely in the long-run for the bulk of its supply of capital from internal sources, i.e., short-run variations in saving domestically generated may merely be offset in international capital markets but this is not a stable and dependable long-term source of investment finance or of life-cycle resource reallocation. Thus, the investment rate will depend upon the rate of domestically generated saving. While many people think of growth rates in terms of a few months or quarters, we have in mind models of economies as they develop over much longer periods of time and their steady state potential growth rates. In an economy where there was no interaction between technological change and investment, increases in saving might increase the investment rate and therefore the capital/labor ratio on a once-and-for-all basis. The economy might transit to a higher growth path, but ultimately the growth rate would converge to its natural rate (in per capita terms the rate of technological change). However, technological change and investment may have important interactions. First, the rate at which society invests in technological change, perhaps as

measured very grossly by R&D expenditures, is likely to be positively related to the rate of new product and process innovation. Second, there may be a substantial amount of learning-by-doing. As new investment occurs, new techniques of production become apparent which would not have been discovered otherwise. This suggests at higher rates of investment, the rate of technological change will increase. Finally, there may be a substantial amount of embodiment. The embodiment hypothesis suggest that it is either impossible or at least extremely costly and therefore uneconomic, to embed new technology in old capital. Therefore, the rate of investment will affect the rate at which new technology is embodied and diffused throughout the capital stock, and therefore, the rate of technological change. Thus, we have three potential avenues by which an increased saving rate, if it is a necessary prerequisite, as I believe it is, to an increased investment rate, may well also increase our rate of technological progress, i.e., our potential long-term growth rate.

There is probably no greater contributor to our sluggish investment and innovation, our overvalued dollar, and our lack of competition in many markets overseas than our enormous impending fiscal deficits. While a deficit of the size, relative to GNP or the available supply of saving, that we are currently experiencing in the midst of a recession is hardly cause for alarm, the prospect of such deficits in the "out years" when we are expected to experience an economic recovery is keeping long-term interest rates, adjusted for inflation, quite high. While many specific structural impediments could be removed, and specific tax and spending devices adopted, some of which I will discuss briefly below, there is no more important general policy than getting the overall level of government spending and revenues roughly in balance, adjusted for inflation and for a major problem in government budgetting I will mention below, averaged over longer periods of time. This will substantially reduce real interest rates, decrease the amount of foreign capital pouring into the United States, help restore a sensible value of the dollar, promote our competition in international markets, and provide the new tax policies

an opportunity to work in an environment where the before-tax cost of capital is at something much closer to its historic level.

There is substantial reason to believe that private markets will not allocate sufficient resources to research and development. This occurs because of a variety of "public goods" properties of research. General knowledge produced in basic research may be commercially exploitable in many areas; it is likely that the full potential returns from this new knowledge will not be privately appropriable, and therefore, the private sector, in responding to its own risks and rewards will underallocate resources to R&D expenditures. It is therefore disheartening that the rate of government investment and government R&D expenditures, other than those associated with the current defense buildup, have been falling sharply. The basic scientific and technological research supported, for example, by the National Science Foundation, provides an important base or foundation for subsequent developments.

It is important to realize that research and development occurs in a variety of contexts in a complex economy such as the United States. Some of it occurs entirely within the government sector; some of it is financed by the government sector but is produced in universities and other private organizations; some of it occurs wholly within private firms; and the nature of each of these endeavors varies substantially. While we all may have in mind the genius working at home on a new process or product, eventually aided by a venture capitalist to bring this new product to market, it is also clear that important technological innovation occurs on a more organized, concentrated scale in mainline industries: for example, basic research in the pharmaceutical industry. Another important example, and one which historically is immensely important to technological change in the United States in the post-World War II period, is Bell Laboratories. Whether this was a fortuitous bringing together of people at the right time and the

right place, or whether the monopoly position, albeit regulated, of AT&T allowed this sort of environment to exist when it might not have in a purely competitive environment, is difficult to evaluate. The important point is that in addition to generating more capital, more affordable capital, and a more neutral tax system (a point I shall return to briefly), there may be a direct role for government to play in financing, subsidizing, or directly engaging in research and development and various types of direct investment.

While the share of government spending in GNP at the federal level grew substantially in the late 1970's (and we are certainly in the process of altering the composition of that spending), it is disheartening to report the dramatic decline in government investment. Direct government investment was several percent of GNP in the 1960's; recently, outside of defense, it has not even been covering the depreciation and obsolescence of the government capital stock. The exact mix of direct government spending on R&D, government financing of R&D, and subsidization of various types of investment which is desirable must be the subject of individual cost-benefit analyses, initiatives in all of these areas almost certainly will be an important component of policies in the remainder of the decade and beyond if we are to restore a healthy growth rate.

The federal government does not keep a separate capital account; since the government investment rate has declined substantially in recent years, a properly measured deficit would report the (inflation-adjusted) current services deficit. Thus, the rate of government investment cannot be inferred solely from the regular deficit figures. Optimal national saving adds personal, business, and government saving. This would be appropriate in the absence of distortions, assuming the government was doing its cost/benefit analyses properly, so that at the margin, government investment was as productive as private investment.

In the absence of this, i.e., if there are a variety of distortions which create differential productivity of government and private investment, we would have to take some weighted average of these saving rates. Or better yet, remove the distortions and equalize the productivity of investment regardless of sector.

As noted above, our tax system still has a variety of types of double taxation of saving, and differentiated taxes on various types of investments. A dramatic simplification and improvement could be made by adopting what (for want of a better phrase) I will call an integrated comprehensive personal and corporate consumption tax. We have been gradually moving toward a hybrid of an income and expenditure tax in our personal tax system for many years, e.g., the adoption of universal IRA accounts. It is also important not to tax corporate source income twice as well as other types of personal saving twice. Therefore, it is important to integrate the corporate and personal income tax. In the context of a consumption tax approach, levied in a personal tax with the potential for various exemptions, deductions, and a varying rate structure, as opposed to a national sales or value-added tax, integration of the corporate and personal tax would be quite straightforward. Since retained earnings are savings on behalf of shareholders and should not be taxed in the first place, all that would be necessary would be to report dividends which were used for consumption and tax them at the personal level, while those that were reinvested or rolled-over would be exempt from taxation until withdrawn for consumption purposes. The same would be true of realized capital gains.

Such a tax system would obviously be more simple than our current tax system. There would be no need for large numbers of combinations of investment tax credits, tax lives, recovery schedules, etc. It would likely increase our overall saving rate, as well as increase the efficiency and allocation of investment among alternative types of investment and remove some of the remaining residual impediments to risk-taking in the capital gains tax. While this would remove some of the hinderance to the generation and efficient allocation of the capital stock in the United States, it is by no means a panacea. It would have to be supplemented by sensible spending policies, moves to control the deficit, government investment in R&D, and other policies, etc.¹

It is also important to point out that our tax system has cycled away from the over-taxation of ordinary investment relative to human capital to more heavy taxation of human capital relative to ordinary investment. As a simple example, with equal before-tax rates of return, the combination of investment credits, ACRS, etc., makes it more profitable to buy a personal computer than to invest in knowledge and skills, since the direct cost of doing so is not generally depreciable under the tax law. For example, college tuition is not deductible or recoverable. If this trend continues for a span of time, we run the risk of misallocating our investment and underinvesting in the complementary human capital investments necessary to take advantage of the growth of new technologies.

¹ See Boskin (1983), U.S. Treasury (1977), or Mieszkowski for further discussions of the nature and administration of a personal consumption tax.

Let me conclude by restating a few basic principles outlined above:

1. Many government policies hinder the generation and adoption of new technology and hence our long-term growth process;
2. While recent structural tax law changes have reduced some of the accumulated disincentives in the tax law, these have been more than offset by the dramatic increase in real interest rates, partly the result of enormous budget deficits; for these powerful reduction of disincentives to begin to work, we need the before-tax of capital to revert to more reasonable levels;
3. While in general we would like the private capital market to decide on where capital was to be invested, there are sensible reasons for believing that there will be underinvestment in R&D, because of the lack of appropriability of the returns to some types of private investment. Therefore, there is an appropriate role for government to play in generating and/or financing R&D expenditures; thus, the substantial decline in the share of our resources devoted to R&D is not only a source of major concern, but a potential target of government economic policy;
4. The decline in our share of GNP devoted to net investment in the private sector is matched by a sharp decline in non-defense government investment in the public sector; judiciously chosen government investments over the next decade and beyond are desirable;

5. Disincentives to supply capital and to allocate it efficiently by industry remain in our tax laws; gradually phasing-in an integrated corporate and personal comprehensive consumption tax to replace our personal and corporate income taxes would be a desirable structural tax policy change designed to increase the overall saving rate, and the amount of investment and risk-taking in society.

6. A dramatic government initiative to channel investment funds to particular technologies and industries is likely to do worse than a market allocation. Only when there is substantial reason to believe that market failures exist should there be any deviation from the goal of neutrality.

Thus, a more sensible aggregate fiscal and monetary policy which will lower the before-tax real interest rate, i.e., cost of capital, modest structural changes in tax laws, modest but important shifts in the composition of government spending toward government investment and research and development, will result in an increase in our rate of technological innovation, the diffusion of this innovation in new and larger investment and hence larger capital stock, and increase our labor productivity and future living standards. A sharp reduction in the projected long-term deficits would also substantially reduce the overvaluation of the dollar and our declining international competitiveness. We need to increase dramatically our rate of net national saving, once out of the recession, perhaps to a level half again as large as our recent average. To do so, we need not only to encourage more private capital formation but to decrease the rate of government dissaving.

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Testimony of John W. Kendrick *

January 20, 1983

Before the Subcommittee on Savings, Pensions,
and Investment Policy, United States Senate Committee
on Finance

The greatest contribution the Federal Government can make at this time to the growth of saving, investment, innovation and productivity is by providing a favorable environment for economic recovery and the efficient operation of markets for both products and factor inputs, labor and capital.

The recent economic contraction has obscured the potential stimulative effects of the Economic Recovery Tax Act of 1981 (ERTA)--particularly the impact on fixed investment of the accelerated Cost Recovery System, the several measures designed to increase saving, and the 25 percent tax credit for incremental research and development outlays (R&D). Renewed economic expansion will immediately increase saving and investment, innovations that were deferred because of the recession, and productivity increases reflecting rising rates of utilization of capacity as well as cost-reducing innovation.

It is my view that the economy is now in the process of turning around, and that the major contribution the Federal Government can make to recovery is by continuing to pursue a disinflationary monetary policy and fiscal policy directed towards budget balance as relatively full employment is re-attained.

Given these prerequisites, I foresee a robust expansion in 1983 and '84 at a 5 to 6 percent average rate per quarter. This is above the consensus forecast

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chiefly because I am projecting annual productivity gains of more than 3 percent, and further deceleration of nominal wage increases to below 6 percent. This will permit some further disinflation to around a 3 percent annual rate, with more of the increase in nominal gross national product (GNP) permitted by the Federal Reserve Board to be translated into real increases. The reasoning behind this projection is contained in an article I wrote for the January 1983 *AEI ECONOMIST*, "Productivity, Costs and Prices: The Outlook for 1983-1984," which will appear in a few days and which I would like to put in the record if it is out in time.

Once the economy again is relatively fully employed, which will probably not be until 1987 if the expansion is of moderate proportions, we can see if saving and investment rates have increased over those in previous prosperous periods, and whether they are adequate to meet the nation's capital requirements. My guess is that they will not be, and that further tax reforms will be needed to reduce the bias against saving and investment inherent in the income tax. I would like to see further shifts towards consumption taxes, or even a value added tax, which are relatively neutral.

One reason I am optimistic regarding productivity growth in the years ahead is that in 1975 real R&D outlays resumed their growth and have increased at a 4 percent annual rate which is faster than real GNP. Consequently the ratio of R&D to GNP, which had dropped from almost 3 percent in 1964 to a low of 2.2 percent in 1977-8, is now back to around 2.5 percent. (See Table 2 of the January 1983 *ECONOMIST*). Allowing for the usual lags, it is possible that the reversal of the R&D slump is partially responsible for the strong productivity performance of the U. S. business economy since the first quarter of 1982 (see Table 1 of the January *AEI Economist*).

The resumption of growth in federally-funded R&D is quite significant, since recent research, at both the micro- and macro-economic levels by Mansfield, Nelson, Terleckyj, Link and others, shows that, with some lag, government R&D, particularly that performed by companies, stimulates privately financed R&D activity. It is important for technological progress that Federal real R&D funding continue to increase steadily. Beyond that, Federal procurement policy could be used more vigorously to promote technological innovations by supplying firms.

As far as private R&D is concerned, it is too early to assess the impact of the 25 percent incremental R&D tax credit. The National Science Foundation projects real increases in 1982 and 1983, but the precise changes and the extent to which the credit was responsible cannot yet be determined. A thorough study should be made in 1985 as a basis for Congress to decide whether to renew the credit after it expires at the end of that year. The possibility of further accelerating the depreciation of equipment, and of structures, used for R&D should also be evaluated.

I would like to see the Federal Government not merely tolerate joint R&D projects involving two or more companies, but actively encourage such projects that are in the national interest as long as collusion on prices and markets are not involved. In that connection, the idea of R&D limited partnerships as described by Secretary of Commerce Baldrige sounds promising. The document, Information and Steps Necessary to Form Research and Development Partnerships, prepared in the Department's Office of Productivity, Technology and Innovation and now available from the National Technical Information Service, should be of interest to many firms.

Another promising initiative has been the NSF program to establish joint industry-university centers for particular areas of applied science and technology. The purpose of these centers is steer university research in practical directions and to accelerate the flow of scientific findings and technological applications to industry. If the current assessment by NSF of the cost effectiveness of this program is favorable, funding should be substantially expanded as envisaged in the Stevenson-Wydler Act of 1980.

Expansion of R&D and the resulting new product and process inventions and improvements stimulate business investment. Conversely, increases in business fixed investment stimulate R&D outlays. If I am right that economic recovery will be significant in 1983-'84 and beyond, I would expect that rising aggregate demand and the favorable provisions of ERTA would stimulate both types of investment, which would, in turn, be mutually reinforcing. Will there be enough scientists and engineers to meet the growing demand? Real education and training outlays have continued to expand during the past decade of reduced rates of growth of productivity and real product. But I suggest that the subcommittee look at supply and demand projections for the rest of the decade of the type prepared by the Department of Labor and the NSF to see if shortages are anticipated assuming reasonably strong economic growth. If so, expanded financial assistance to students in these disciplines would be in order.

With regard to training, it is my conviction that the Federal Government should have an effective on-going program to facilitate the shifts of labor among industries and occupational specialties that are continually taking place in a dynamic economy. When economic conditions are good, more of the costs of training can and will be borne by private enterprises.

Markets work better in prosperous times, of course. Even then there are conditions that can justify governmental actions beyond the usual anti-trust measures to promote competition and prevent collusion. One such action is the expanded collection and dissemination of commercial and technological information by various government agencies such as the Departments of State and Commerce. This is particularly important with respect to scientific and technological information from other advanced economies that have caught up or surpassed U. S. knowledge and know-how in an increasing number of industries. Specifically, the Patent and Trademark Office is in a good position to strengthen its information gathering, retrieval and dissemination functions, including information on foreign technologies.

With regard to patents, there is a need to improve the reliability of the patent grant, and to secure greater protection for U. S. inventors with foreign patents in some countries. Some businessmen advocate lengthening the period of patent protection from 17 to 20 years as in Great Britain.

It is my impression that the capital markets in the United States are quite competitive, and work well in channeling funds into investments with attractive expected rates of return. A case can be made for special tax and other policies to favor small companies, especially those in high technology areas with good growth prospects. There are already a number of such measures on the books, and the Small Business Administration has made lists of additional policy options to promote small firms, which I need not repeat here.

Finally, I must emphasize that beyond the broad measures suggested above to promote technological advance generally,* I do not favor "industrial policy" designed to promote selected industries or types of civilian technology except in unusual or exceptional circumstances. I do not see why government officials should have any keener vision of the waves of the future than do the executives who run the enterprises that produce the goods and services designed to meet anticipated market demands.

* In 1979 I discussed almost 100 policy measures to promote productivity growth, many of which related to investment and technological advance. Some have since been enacted. See John W. Kendrick, "Policies to Promote Productivity Growth," in Agenda for Business and Higher Education (Washington: American Council on Education, 1980), pp. 44-135.

Productivity, Costs, and Prices: Outlook for 1983-1984

John W. Kendrick

Favorable developments in productivity, costs, and prices during 1982 appear to have set the stage for a significant economic recovery in 1983 without accelerating inflation. The change in productivity, measured by real gross product per hour in the U.S. business economy, increased progressively from negative territory at the turn of the year 1981-1982 to a gain of 4.2 percent at an annual rate in the third quarter of 1982 (the latest for which estimates were available at the time of writing). Boosts in average hourly labor compensation declined progressively over the same period to a rate of 6.1 percent. As a result, increases in labor costs per unit of output decelerated sharply from double-digit heights at the end of 1981 to only 1.8 percent (see

table 1). With the rate of price inflation in the business economy holding around 4 percent during 1982, the ratio of price to unit labor cost rose in the third quarter for the first time since the short-lived 1980-1981 expansion. The usefulness of the price/unit labor cost ratio as a profit indicator was confirmed by estimates of corporate profits, which rose by about \$8 billion at an annual rate in the third quarter.

In looking ahead through 1984, the key questions are whether productivity gains will remain strong and wage-rate gains moderate. If so, this would mean continued small increases in unit labor costs and further recovery of corporate profits consistent with the administration's and the Federal Reserve Board's goal of preventing a renewed surge of inflation. Together with some further easing of long-term interest rates, a favorable cost-price relation provides the basis for a solid economic recovery. The expansion could, in my opinion, be somewhat stronger than consensus forecasts

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TABLE 1: CHANGES IN PRODUCTIVITY, UNIT LABOR COSTS, AND PRICES IN THE
U.S. PRIVATE DOMESTIC BUSINESS ECONOMY,
1948-1982, BY SUBPERIODS

	Real Gross Product per Hour	Labor Compensation per Hour	Unit Labor Cost	Implicit Price Deflator
<i>Average annual percentage rate of change</i>				
1948-1966	3.2	5.0	1.8	1.8
1966-1973	2.3	6.9	4.5	4.2
1973-1979	0.8	8.9	8.1	7.6
1979-1980	-0.7	10.4	11.2	9.4
1980-1981	1.8	9.6	7.7	9.5
<i>Percentage change over prior quarter, at annual rate</i>				
1981, fourth quarter	-2.9	7.4	10.6	8.0
1982, first quarter	-1.0	7.3	8.4	3.8
1982, second quarter	1.4	6.9	5.5	4.3
1982, third quarter	4.2	6.1	1.8	4.1

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

suggest without inflationary damage, in view of the degree of excess capacity and the potential for substantial productivity gains that would keep unemployment from declining sharply. This would continue to exert downward pressure on wage and unit cost increases.

As background for discussing the outlook for these crucial variables over the next two years, I shall first review the typical cyclical behavior of productivity, average labor compensation, and unit labor costs and prices. Then I shall discuss the outlook for each of the cost components and for the cost-price relation for 1983-1984 with reference to the average movements during the first two years of expansion in the seven full cycles since 1948.¹ Even though we know that the future will not duplicate the past, the recent historical patterns do provide a guide and a point of departure for considering what special features are likely in the peri-

od ahead and what deviations from past performance they might produce.

The Typical Cycle Pattern

In his famous work, *Business Cycles*, published almost seventy years ago, Wesley C. Mitchell hypothesized that changes in the cost-price relation lay at the heart of the business cycle. His analysis of the relative movements of productivity, wage rates, unit labor costs, prices, and other financial variables could not be fully tested at the time because of lack of data. But in the late 1950s, the Bureau of Labor Statistics began publishing quarterly estimates of real product per labor hour and associated variables going back to 1947. Since then statistical analyses have largely borne out Mitchell's theory.² The following summary is based on the typical cycle sequence since World War II.

During expansions productivity advances smartly as

1. I am using the chronology of the National Bureau of Economic Research, except for counting the mini-recession in early 1967 as the end of the cycle that began in early 1961. It should also be noted that the most recent expansion between the second quarters of 1980 and 1981 lasted only four quarters, and the 1958-1960 expansion, eight quarters. The other six expansions had an average duration of fifteen quarters; all eight expansions averaged a bit over three years.

2. In addition to work by Geoffrey Moore at Rutgers, two doctoral students at The George Washington University, Anthony Cluff and Norman Elrod, prepared doctoral dissertations in 1970 and 1981, respectively, subjecting Mitchell's hypothesis to statistical tests.

production recovers back to around the most efficient rates of utilization of capacity in most industries. At the same time, wage-rate increases are generally moderate as excessive unemployment, inherited from the recession, overhangs labor markets. Consequently, unit labor costs decline or rise more slowly than prices, permitting a recovery of profits. But in the latter stages of expansion, productivity growth slows down, while

"In looking ahead through 1984, the key questions are whether productivity gains will remain strong and wage-rate gains moderate."

wage-rate increases accelerate as labor markets tighten. Unit labor costs also accelerate, eventually pressing against prices and squeezing profit margins. The profit squeeze is a key element in turning the economy down since it adversely affects investment commitments and outlays.

In the early stages of contraction productivity growth falters. Wage-rate increases remain strong, however, reflecting past labor agreements plus some uncertainty as to the outlook, which leads employers to hold on to workers since labor turnover is costly. Once it is apparent that the contraction is real and profits continue to decline, employers start paring payrolls, laying off less efficient workers if union rules permit and concentrating production in more efficient plants. Employees also tend to increase their efficiency as rising unemployment causes them to value their jobs more highly, and resignations decline. Consequently, productivity changes begin to rise before the cycle trough, while wage-rate hikes are moderated as labor markets loosen. Unit labor cost increases decline and eventually fall below the rate of price change. Profit margins then rise and together with declining interest rates exert a favorable effect on expectations and investment commitments, setting the stage for recovery.

Assessing the Outlook

That arbiter of business cycle turning points, the National Bureau of Economic Research, has not yet identified the trough of the latest cycle, whose quarterly peak was set in the second period of 1981, with the monthly peak in July of that year. The quarterly low in real GNP occurred in the first quarter of 1982. The

increase in the second quarter was an anemic 2 percent annual rate and was less than 1 percent in the third quarter. Preliminary data indicate a decline in the fourth quarter almost back to the first-quarter level. In view of the continued sag of industrial production throughout most of 1982, analysts are reluctant to pronounce the first quarter to have been the trough. There is no reason to doubt that increases in service sector output have offset the decline of industrial production. But an essentially flat real GNP in 1982 meant a continued increase in unemployment and in the gap between actual and potential output. In that sense one cannot date an upswing before the first quarter of 1983 at best.

The average forecast of real GNP growth for 1983 over 1982 has been revised down in recent months to below 3 percent,³ and the administration forecast is below 2 percent. The scenario I discuss here is more optimistic—3.3 percent growth, which implies an average quarterly increase of 5½ percent from the fourth quarter of 1982 to the same quarter of 1983. Even this is well below the average rate of expansion in the first year of prior recoveries since 1948, but it is about the average of the top half of growth forecasts for 1983. The reason I think this is a probable scenario is that I expect productivity growth to be higher and increases in unit costs and prices to be lower than does the typical forecaster. This would permit more of the increase in nominal GNP that is likely to be permitted by a monetary policy aimed at continued disinflation to take the form of output growth. These favorable developments are likely to continue in 1984 as well, for reasons to be detailed below.

Real Product per Labor Hour. The average quarterly rate of increase in output per hour during past initial years of expansion has been 4.7 percent, about 60 percent of the average 7.7 percent rate of growth of real gross business product. But while rates of growth of output and of productivity are interrelated, productivity growth has an autonomous element, which is indicated by its cyclical lead over output. The amount of productivity growth we get in any system will depend on some long-term factors, such as demographic developments, policies affecting investment, and so on. Also, productivity growth tends to set a limit to output growth. Since I believe that basic causal forces, in addition to cyclical forces, are becoming favorable, I

3. See Robert D. Eggert, ed., *Blue Chip Economic Indicators*, December 10, 1982.

am projecting a relatively strong 3½ percent growth in real business product per labor hour in 1983. Indeed, it can be argued that the trend rate of productivity growth is in the process of recovering from less than 1 percent in 1973–1981 to at least the long-term average of more than 2 percent. I have developed the arguments to support this position elsewhere,⁴ but they are summarized briefly below. The strong performance of productivity since the initial quarter of 1982 in the face of a flat production trend further buttresses the optimistic view of productivity growth in the period ahead.

The chief arguments for expecting resumption of a stronger productivity growth trend may be summarized as follows. The increase of real capital per unit of labor input will accelerate, not only because of a deceleration in labor force growth during the 1980s, but more posi-

tively because of a stronger rate of capital formation. The effects of the accelerated cost recovery system, and other measures to stimulate saving and investment, have been obscured by the recent recession. But the tax measures together with falling inflation and interest rates should lead to a strong growth of the real stock of capital once expansion is under way. This assumes that

"The real stocks of technological knowledge are now growing faster than they have for some time."

fiscal policy will not abort the favorable trend of interest rates by running exceptionally large deficits.

The real stocks of technological knowledge are now growing faster than they have for some time. R & D outlays rose rapidly for a couple of decades after World War II, but leveled out in the mid-1960s as a ratio to real GNP at just under 3.0 percent. After 1968, real R & D spending sagged as the portion financed by the federal government was curtailed sharply, and private R & D

4. See John W. Kendrick, "Productivity Trends and the Recent Slowdown: Historical Perspective, Causal Factors, and Policy Options," in *Contemporary Economic Problems*, 1979, William Fellner, ed. (Washington, D.C.: American Enterprise Institute, 1979), pp. 17-69.

TABLE 2: RESEARCH AND DEVELOPMENT EXPENDITURES.
SOURCES OF FUNDS BY SECTOR, 1953–1983

Year	Constant (1972) Dollars (millions)			Percentage of GNP		
	Total	Federal govt.	Industry and other	Total	Federal govt.	Industry and other
1953	8.68	4.65	4.03	1.39	0.75	0.65
1968	29.8	18.1	11.7	2.82	1.71	1.11
1975	28.2	14.6	13.6	2.27	1.17	1.10
1976	29.6	15.1	14.5	2.27	1.16	1.11
1977	30.7	15.5	15.2	2.24	1.13	1.11
1978	32.2	16.0	16.2	2.24	1.11	1.13
1979	33.8	16.5	17.3	2.28	1.12	1.16
1980 ^a	35.1	16.7	18.4	2.37	1.13	1.24
1981 ^a	36.1	17.0	19.1	2.39	1.13	1.26
1982 ^b	37.0	17.3	19.7	2.45	1.14	1.31
1983 ^b	38.3	n.a.	n.a.	2.51	n.a.	n.a.

NOTE: n.a. = not available.

a. Preliminary.

b. Projected estimate.

SOURCE: *National Patterns of Science and Technology Resources, 1982* (Washington, D.C.: National Science Foundation, 1982); 1983 projection supplied by National Science Foundation.

grew only slowly (see table 2). The year 1975 saw the low point in both federal and total real R & D, and the ratios to GNP reached their lows at 2.24 percent in 1977-1978. Since then the growth of total real R & D at a 4 percent annual rate has exceeded the growth of real GNP, and the ratio has risen to 2.45 percent in 1982. The 2.5 percent projected for 1983 may be underestimated if industry-financed R & D

"The experience of the past years does indicate that wage increases slow down when unemployment exceeds 8 percent and is rising. Whether 8 percent is the appropriate threshold when unemployment is falling will depend largely on expectations. This is why it is so important that the administration stick to credible disinflationary policies during the expansion."

experiences a significant stimulus from the 25 percent incremental R & D tax credit, as well as from economic recovery. Even given the usual lags between R & D outlays and their impact on innovations, the upsurge since 1978 should be having an effect by now, and indeed may be partially responsible for the strong productivity performance over the past year.

Changes in the age-sex mix of the work force, which had accounted for part of the productivity slowdown after 1966, will be favorable in the 1980s as the baby boom generation moves into more experienced, higher pay brackets. Investments in education and training per worker are expected to continue to rise. Reallocations of labor and other resources out of agriculture and other areas with low factor remuneration provided less of a boost to productivity growth in the 1970s than earlier and are not expected to provide a new lift in the 1980s. But it is quite possible that average rates of utilization of capacity will be higher in the years ahead than in the past decade and that stronger growth will provide greater economies of scale than in the 1970s. In other words, I believe that the disinflationary developments of the past several years have helped to set the stage for stronger growth with less pronounced cyclical contractions in the decade ahead than in the one just past.

Since around 1970, sharp increases in the costs of complying with government regulations are credited with contributing to the productivity slowdown. Conversely, attempts to rationalize regulations and reduce their burden, begun in the latter 1970s and reinforced

under President Reagan, should reduce their drag on growth as measured.

Labor efficiency as such under given technology is difficult to measure at the aggregate level. But it is generally conceded that substantial productivity gains could be achieved by improving it. Just in the past couple of years, there has been a marked upsurge in the numbers of quality circles and other employee involvement (EI) schemes in U.S. companies. A recent survey conducted by the New York Stock Exchange revealed that most managements judge that the various productivity improvement programs have been successful in their objective.⁵ Indeed, part of the increases in productivity during 1982 in the face of a flat production performance may well be attributable to the rapid spread of EI plans. The boost to productivity gains from this source could continue for a while. In the long run, however, we must rely chiefly on cost-reducing technological innovations, largely embodied in new capital goods, and the associated human investments and organizational changes for continued productivity growth.

Average Hourly Labor Compensation. In the past, increases in nominal average hourly labor compensation have generally moderated during economic contractions. Quarterly movements are somewhat erratic, but during the first year of expansion they remain near the levels reached in the trough. By the second year, there is some tendency toward acceleration.

Average compensation increases peaked at an 11.7 percent annual rate in the first quarter of 1981, just prior to the cycle peak. The decline between the third quarters of 1981 and 1982 was from 9.0 to 6.1 percent. Similar substantial deceleration occurred in other pay measures. Increases in average hourly earnings in private nonfarm industries decelerated from annual rates of 8.0 to 4.4 percent over the same period. The hourly earnings index for the same sector, which is adjusted for changes in overtime premiums and in industrial composition of employment, decelerated from 8.5 to 6.0 percent.

Of greater import for the future has been the pattern of major collective bargaining settlements in private industry. During the first three quarters of 1982 wage adjustments averaged 3.8 percent in the first contract

5. See New York Stock Exchange Office of Economic Research, *People and Productivity: A Challenge to Corporate America* (New York: New York Stock Exchange, 1982).

year and 3.5 percent over the life of the contracts. These averages compare with 8.3 and 6.4 percent, respectively, in the previous settlements by the same parties. Total compensation, including benefits, showed even smaller increases in 1982. About two-thirds of workers under the 1982 settlements are covered by clauses allowing a cost-of-living adjustment (COLA). Those settlements averaged 1.9 percent over the life of the contracts, excluding the cost-of-living adjustment, compared with 6.7 percent in contracts without a COLA. The averages may be abnormally low, reflecting a preponderance of contracts in industries such as meat packing, trucking, autos, rubber, and airlines that were particularly hard hit by the recession. Many of the contracts were renegotiated early, and some provided for temporary wage freezes, or nominal raises. A recent issue of *Business Week* observes:

Bargaining in 1983 is likely to cement the trend towards modest agreements. It will also mark the end, at least for a while, of the pattern setting influence of contracts in autos and steel, whose expensive packages used to pull up settlements in related industries. The payoff may be wage-moderation in major industries until 1987 that could help sustain a recovery without adding to inflation.⁶

Unions in construction, communications, food, glass, aerospace, and longshoring, which are on the 1983 bargaining calendar, may not settle as cheaply as other unions did in 1982. But high unemployment will continue to exert downward pressure on both union settlements and nonunion wage adjustments. During 1983, if expansion is no greater than the 3½ percent mentioned above—given the 3½ percent productivity projection, continued growth in the labor force, and some upturn in average hours worked—unemployment cannot be expected to fall below 10 percent. By latter 1984, it seems unlikely that it would fall much below 9 percent unless economic growth were considerably more vigorous than is now forecast or targeted by the Reagan administration.

It would be nice to think that union leaders would accept progressively more moderate hikes in average nominal labor compensation as a means of contributing to further disinflation and a stronger growth of employment, given the nominal increases in GNP implied by a monetary policy designed to bring down inflation.

These considerations may indeed have some influence, especially when it comes down to preserving jobs in particular industries. But it is hardly cynical to say that the excess supply of labor in most industries will probably be the major force conducing to further moderation of pay increases.

It is not improbable that gains in average hourly labor compensation in the business sector will soften somewhat further, possibly averaging around 5½ percent in 1983. With unemployment averaging more than 9 percent in 1984, some further deceleration, possibly to 5 percent, is not out of the question. A 5 percent average rate of increase in average labor compensation puts us back to what prevailed in the first two postwar decades when price inflation averaged around 2 percent a year. But since a 2 percent productivity trend seems more likely than a 3 percent trend, the inflation may exceed the pre-1966 rate.

This type of projection must be quite tentative because the economy is operating in uncharted territory. True, we have had over 10 percent unemployment before, but the accompanying circumstances (whether in 1931 or 1941) were so different that history provides little guidance for estimating the effect on wage rates. The experience of the past years does indicate that wage increases slow down when unemployment exceeds 8 percent and is rising. Whether 8 percent is the appropriate threshold when unemployment is falling will depend largely on expectations. This is why it is so important that the administration stick to credible disinflationary policies during the expansion.

Unit Labor Costs and Prices. Unit labor cost increases moderate before the trough and typically continue to decline in the first quarter of expansion. The ratio of prices to unit labor costs starts rising about two

"In the first half of 1982 the ratio of price to unit labor costs fell, then increased as reflected in rising corporate profits in the third quarter. Assuming that recovery is at hand, the ratio should rise for several more quarters and profits continue to grow, fueling the recovery."

quarters before the trough. For the first year of recovery, the increases in unit labor costs are generally less than those in the price level, so that profit margins continue to widen. In the second year, unit labor costs

6. *Business Week*, December 20, 1982, p. 72.

rise a bit relative to prices, so profit margins may narrow, but total profits continue to expand as volume grows.

In the first half of 1982 the ratio of price to unit labor costs fell, then increased as reflected in rising corporate profits in the third quarter. Assuming that recovery is at hand, the ratio should rise for several more quarters and profits continue to grow, fueling the recovery. In the previous section, it was suggested that wage rates would increase by $5\frac{1}{2}$ percent and labor productivity by $3\frac{1}{2}$ percent during 1983, on average, so that unit labor cost increases would continue around the 2 percent rate reached in the third quarter of 1982.

Given these parameters and the $5\frac{1}{2}$ percent real growth, the monetary authorities could allow nominal GNP to rise at a rate of $8\frac{1}{2}$ percent per annum. This would still leave room for some restoration of profit margins and further disinflation to around 3 percent a year, on average, from the 4 percent of 1982 as measured by the implicit price deflator for gross business product. Allowing nominal GNP to rise by more than $8\frac{1}{2}$ percent would probably not be compatible with further disinflation unless productivity growth exceeded the estimate presented here.

Productivity growth generally decelerates in the second year of expansion. Even though wage-rate in-

creases may soften a bit more in 1984, it would not be surprising if unit labor cost increases rose a bit to around 3 percent. If the monetary authorities again permitted an increase in nominal GNP of $8\frac{1}{2}$ percent or so, real growth could continue at better than a 5 percent rate without rekindling inflation. Prices could increase by no more than unit costs and still permit rising profits as volume expanded. In the longer run, the rise of nominal GNP would have to be significantly lower than $8\frac{1}{2}$ percent per annum to keep inflation from reviving, since the long-term growth rate is below that envisaged for the first two years of expansion.

For this favorable, but fragile, projection to prevail, I must assume that there will not be an abnormal upsurge in energy or agricultural prices that would either raise the rate of inflation, if growth of the money supply permitted, or put downward pressure on other prices and profits. Weakness in raw material prices would have the opposite effects, though the favorable macroeconomic impact would come at the expense of farmers and other producers. But if the coming economic expansion in the United States spreads and gains momentum throughout the free world, prices of raw materials are more likely to be strong than weak, and the inflation rate may inch up between 1983 and 1984, but remain low in comparison with the past half dozen years.

Senator CHAFEE. Professor Kendrick, why are you so much more optimistic about the growth rates than the Administration?

Dr. KENDRICK. Well, that is spelled out in my January AEI letter. The basic reason is that I have been impressed by the strength of increase in productivity since the first quarter of last year. We went from a negative in the first quarter to a plus-1 in the second, to plus-4 in the third—4 percent—and I understand that the fourth quarter will show a gain despite the drop in real GNP because employment has dropped even more. And all of that despite a flat GNP from first to fourth, which is quite remarkable.

And I think, with economic recovery, we get the usual kicker of increasing rates of utilization of capacity, meaning higher productivity growth.

But beyond that, I think that we have this big pool of unexploited innovations that have built up that will begin to feed into industrial processes in this year and next that will help keep productivity gains up.

So in general I think the outlook is good, and of course that helps in holding down the increasing costs and prices, which means that whatever nominal GNP increases the Federal Reserve Board permits—less will run off in inflation, and there will be more coming through into a physical volume of production.

Senator CHAFEE. Do you agree with that, Dr. Boskin?

Dr. BOSKIN. I agree with the gist of Dr. Kendrick's analysis. I guess I would put the investment boom that he sees taking advantage of the unutilized investment opportunities that have come about due to the recession, and the lower interest rates, probably a year or two further into the future than he does.

I should say that I think the administration's forecast, while plausible, is pessimistic. It has, unlike the first two forecasts of the administration, moved to the other end of the spectrum. It has moved from overly optimistic, I believe, to underly optimistic. Perhaps that is the result of having overestimated—

Senator CHAFEE. Are you talking about the deficits they have projected?

Dr. BOSKIN. I am talking about they have a very low estimate of real growth for next year, 3 percent fourth quarter over fourth quarter, which is very, very low for an economic recovery. That also leads to a larger projected budget deficit than would be the case if the economy was more robust and there was more tax revenue coming in.

I do not believe we will see as strong a recovery as we have seen in other postwar recoveries, for a variety of reasons:

Structural changes in the economy—when people start buying automobiles a much larger fraction of them are going to be imports this time around than was the case in 1974-75 or when we came out of the 1958-59 recession.

We are starting with interest rates at a much higher level than in previous recoveries.

But I think we will probably have a more robust recovery than the administration forecasts.

I wholeheartedly agree with the nature of Dr. Kendrick's analysis. I think the structural changes in the tax law and the fact that we have a backlog of unutilized investment opportunities and dis-

semination of innovation opportunities augur well, but I would place that in the mid- to late-eighties. I am not as convinced as Dr. Kendrick that it will occur rapidly in the next year or 18 months.

Senator CHAFEE. Gentlemen, thank you very much. I appreciate both of you being here. That sentence as you depart will leave an optimistic note.

Now, finally, two very patient gentlemen, Mr. Allen and the Honorable Clark MacGregor.

Gentlemen, you represent a couple of giants in the field. I appreciate your both being here.

Let's hear from Mr. Allen.

STATEMENT OF CHARLES R. ALLEN, EXECUTIVE VICE PRESIDENT AND CHIEF FINANCIAL OFFICER, TRW, INC., CLEVELAND, OHIO

Mr. ALLEN. Thank you, Senator Chafee.

I am Chuck Allen, executive vice president and chief financial officer of TRW. TRW is a worldwide business engaged in manufacturing and service of high technology products. Our annual sales are in excess of \$5 billion.

Senator CHAFEE. Where are your headquarters, in Cleveland?

Mr. ALLEN. Yes, sir.

In 1981 and 1982 our company-sponsored research and development, by the most restrictive definition, was about \$91 million and \$120 million, respectively.

We believe that the United States should promote a tax environment which allows high technology growth companies to be competitive in the world marketplace. Specifically, TRW supports tax incentives for research and development.

We are keenly aware of the importance of research and development, both to our organization and to the U.S. economy. As an investment in high technology and future job creation, it is an investment worthy of special protection, we believe.

Consistent with this goal, the Economic Recovery Tax Act of 1981 made specific provision to foster technological innovation through U.S. based R&D. This included both the R&D tax credit and the 2-year moratorium on allocation of research and development expense under the 861 regulations for foreign tax credit purposes. By combining these two provisions in one tax bill, the Congress fulfilled a principal objective of good legislation, and that is coordination.

Since the moratorium period is coming to a close this year, the Congress must reconsider at this point whether or not to extend the moratorium and thus the coordinated tax support of U.S. research and development.

You won't be surprised when I say that, in our opinion, that moratorium should be extended.

To clarify our position, let me give just a bit of background:

The allocation of expense under the 861 regulations—that is, prior to the moratorium—was clearly a disincentive to research and development. It effectively forced an arbitrary percentage of R&D expenditures to be allocated against foreign earnings. The foreign tax credit limitation was thus reduced, and that equates to a

loss of deduction. A worldwide company approaching its foreign tax credit limitations would find that each dollar of increased R&D expenditure would reduce some portion of its foreign tax credit. Under some circumstances the lost foreign tax credit could actually exceed the benefit of the R&D credit.

Now, as we know, a basic purpose of the 861 regulations is to match revenue and expense by geographic source, that is, foreign versus United States. This is admittedly an extraordinarily difficult tax.

An implicit assumption of the allocation process is that R&D expense is incurred to generate royalty income, both currently and in the future. Accordingly, prior to the moratorium, R&D expense was allocated on that basis.

This concept does not match TRW's business practice nor experience. R&D is encouraged to generate sales income, not royalty income. Royalty income represents marginal profit.

Looked at another way, royalties represent a way to reduce the cost of R&D but are not the primary purpose of R&D.

To deny a deduction for such expenditures through the foreign tax credit mechanism not only undermines our effort to encourage U.S. technological exploration, but seems to lack basis in equity.

To the extent that non-U.S. subsidiaries take undue advantage of a U.S. parent company's technology, either through insufficient royalties or expense reimbursement, then the Internal Revenue Code, section 482, is available to remedy that abuse.

Among the countries where TRW does business, the United States is unique in allocating research and development and thereby denying a deduction for R&D through the foreign tax credit mechanism.

Many countries fully support R&D through tax and fiscal measures and incentives. Particularly noteworthy are the arrangements in Canada and Japan. This both gives non-U.S. companies a competitive advantage and encourages a transfer of R&D outside the United States.

While our company has not consciously transferred R&D projects to other countries to escape the detrimental tax impact in the United States, the lower costs abroad are not likely to be ignored over an extended period of time. We have reason to believe that R&D investment in foreign markets by U.S. companies is in fact increasing faster than in U.S. markets. A permanent end to the allocation of R&D against foreign source income we think is an important first step in reversing this trend.

While it is true of the 861 regulations in general the computations for R&D are particularly onerous. Regulations have provided a set of very complex rules; and despite the complexities of the calculation, the results are often absurd.

For example, assume a U.S. company performs research and development on ballistic missiles. All of this research is performed within the United States. The only revenue reasonably anticipated from this research is also a U.S. source. At the same time, various foreign subsidiaries of the same company produce an array of automotive engine parts—valves, pistons, and so forth. Since both the missiles and the engine parts fall within the same two-digit Standard Industrial Class code, the SIC code, that is, transportation

equipment, the regulations cause us to allocate the U.S. ballistic missile research against the dividend income from the foreign subsidiaries producing engine parts. To a knowledgeable observer it is not clear at all how the missile research can possibly benefit parts production.

The regulations do provide for certain alternative computations to the broad grouping of missiles and engine parts. Unfortunately, the alternative computations are so cumbersome and so complicated as to make their application extremely difficult. We have discussed this problem with other companies, and we are not aware of any which are able to avail themselves of the alternative computation.

In my written statement I have submitted a simplified computation of the R&D allocation, to demonstrate how the process acts to reduce the deduction for research and development.

We understand that when Congress reconvenes, Senator Wallop will introduce legislation to make the moratorium on allocation permanent. We strongly urge the members of this subcommittee to support that legislation.

While the allocation of R&D under 861 regulations is an immediate problem because of the pending end to the 2-year moratorium, let me just add a few words on a related topic, and that is the R&D tax credit.

The legislation as enacted was for 5 years and is scheduled to expire at the end of 1985. It is very difficult to recognize the benefits of this tax credit in long-term investment analysis when there is a lack of certainty about its future. The closer we get to 1986 the greater the impact of the termination date on our financial review. A permanent credit is more likely to generate the long-term capital that successful R&D requires.

To conclude, let me say that investment in high technology is critical to the future economic well being of our country. It requires a long-term capital investment in R&D, particularly vis-a-vis other countries. As such, we would hope that the Federal Government would nurture and protect that investment. The allocation of R&D against foreign-source income is counterproductive. In addition, its administration is wasteful of resources and arbitrary in the results.

We urge that the moratorium be made permanent. Further, to reap the maximum benefits of the R&D tax credit through long-term investments, we also urge that this credit become permanent.

That concludes my statement, Mr. Chairman, and I thank you.

Senator CHAFEE. Mr. Allen, thank you very much. There will be some questions after Mr. MacGregor finishes.

Mr. MacGregor?

Mr. MACGREGOR. Thank you, Mr. Chairman.

Senator CHAFEE. Thank you for coming.

**STATEMENT OF MR. CLARK MacGREGOR, SENIOR VICE
PRESIDENT, UNITED TECHNOLOGIES CORP., WASHINGTON, D.C.**

Mr. MACGREGOR. Good afternoon.

I am Clark MacGregor, senior vice president of United Technologies Corp. Our company designs, develops, and manufactures prod-

ucts with high technology content. We are headquartered in Hartford, Conn. Our annual sales volume is \$14 billion. We do our work with approximately 180,000 employees. Our annual exports to other countries, direct and indirect, exceed \$2 billion annually. We invest over \$800 million each year in research and development, and we spend over \$500 million annually to keep our factories and equipment modern.

We are perhaps better known by some of our constituent units, such as Pratt & Whitney aircraft engines, Otis elevators and escalators, Carrier air conditioners and heat pumps, commercial and military Sikorsky helicopters our Mostek semiconductor circuit manufacturer. We also have units which produce aircraft propellers, electronic systems and components, and building and telephone wire and cable.

Like you and your distinguished subcommittee, Mr. Chairman, we have an intense interest in public policies that will stimulate productivity, will enhance production of new products and services, and will gainfully employ all of our citizens.

Mr. Chairman, with your permission, I would like to skip over much of what is contained in pages 3, 4, and 5 of my prepared statement, it being my understanding that the entire statement will be printed as part of the committee's record.

In those skipped pages, we have made comments that we think are exceedingly important with respect to the 1981 Economic Recovery Tax Act and the frequently unwise actions, which budgetary considerations apparently demanded, in the 1982 tax legislation.

In turning now, beginning on page 6 of my statement, to specific suggestions with respect to foreign tax policy, I'm sure you will be pleased to know that since Mr. Charles Allen has expressed the points of view of United Technologies perhaps better than I could, we would like to emphasize, as a corporation, our support for the views expressed by TRW through the excellent statement of Charles Allen.

There are, however, some points that I would like to make by way of emphasis:

You are familiar with subpart F, which has been referred to. It requires that certain passive income earned by U.S.-owned foreign subsidiaries is to be taxed currently—that is, taxed before it is remitted to the United States. Although this policy creates a greater burden than carried by some of our foreign competitors, do not suggest at this time that any changes should be made in U.S. foreign tax policy.

By this, we mean that the taxation-before-remittance concept of subpart F should be neither expanded nor contracted. At a time of national deficit and unemployment, suggestions are expected to be made to the effect that earnings of U.S.-owned foreign subsidiaries should be currently taxed, before the profits are remitted to the United States. To preserve the present status of the worldwide competitive posture of U.S. companies, such suggestions must be resisted.

We note, as Mr. Charles Allen has stated, that some U.S. tax rules actually serve to stimulate the export of jobs.

In particular, we have in mind section 1.861-8 of the Income Tax Regulations issued by the Treasury in 1977. The Internal Revenue

Code has long provided that foreign-source income must be reduced by an allocation of expenses incurred in the United States. In the 1977 regulations, it became required that substantial amounts of research and development costs spent in the United States had to be deducted against foreign-source income. This, in turn, reduced the foreign tax credit. The net effect is that certain R&D costs incurred in the United States are not deductible for U.S. Federal income tax purposes.

In recognition of this problem, the Congress suspended the IRS regulations in the 1981 tax act, for the years 1982 and 1983. At the same time, Treasury was to study this matter and to report to the Congress. To our knowledge, no such report has yet been made.

We strongly urge that this problem be resolved quickly, and that the Congress act to suspend the regulations permanently. It is wrong to have a tax policy which has the potential of discouraging research and development efforts in the United States.

Senator CHAFEE. Both you gentlemen talked about the potential. As you know, we are constantly wrestling up here with incentives as opposed to loss of revenue. As a matter of fact, has this potential been realized, Mr. Allen? I think you indicated it had not; none of your R&D had been transferred overseas because of this.

Mr. ALLEN. No; it has not. Our R&D has tended to grow at an average of 10 to 15 percent a year. We are continuing to increase our R&D, and that has been largely in the United States.

Senator CHAFEE. How about you, Mr. MacGregor?

Mr. MACGREGOR. I think our answer would be the same. But it should be noted, Mr. Chairman, that United Technologies does have manufacturing facilities in a great many countries outside the United States, and associated with those activities is certain research and development work.

But we have had no instance that I can say where we have taken an actual research and development project, contemplated or planned for execution within the United States, and moved it offshore.

But as Mr. Allen has pointed out, if the financial bottom line is such that a company is penalizing itself by, in fact, continuing research and development here that might be done in a nearby foreign country, such as Canada, I can foresee the situation arising where a company would be obliged, to maintain its competitive posture, to take such a step.

Senator CHAFEE. We are not challenging you to do this in order to prove your point. Just because you haven't done it, doesn't mean that we shouldn't straighten out the law.

Mr. MACGREGOR. That would be our position, Mr. Chairman.

Senator CHAFEE. All right. We will request a copy of that and see what Treasury has done.

Please continue.

Mr. MACGREGOR. We also take note that the 1982 tax amendments dealt blows to the ability of private companies to retain funds for working capital. The amendments have speeded up corporate estimated tax payments. Now a company must have paid 90 percent of its taxes by December 15. The penalty for underpayment is so severe that a company cannot afford to underpay.

The standard of forecasting accuracy that is demanded by this amendment is, frankly, beyond the capability of most companies. Such trends should not be allowed to continue.

The above observations that I have made are applicable in the near term; that is, further erosion of sensible provisions must not occur; the Accelerated Cost Recovery System must be preserved; consideration should be given to restoring the provisions that were included in the 1981 act; and the research and development tax credit must be preserved and must be made permanent.

On page 10 of my statement, we express a view with respect to double taxation.

New proposals that might provide further stimulation of productivity probably cannot be adopted at this time if the effect is to widen the Government's substantial deficit.

Nevertheless, it is a fact that the U.S. policy is to tax business earnings twice—first, a 46 percent tax is imposed at the corporate level, plus, of course, State income taxes. Then, when the earnings are distributed to the share owners who have supplied the capital, the earnings are taxed again, up to 50 percent.

This means that investors ultimately keep 25 cents on a \$1 of business earnings. On top of that, increases in the value of a shareholding are taxed, up to 50 percent if the holding was for less than a year. Under such a burden one wonders what it is in our economic system that permits the capital markets to operate as well as they have.

Many of our foreign competitors do not operate under such systems. In West Germany, distributed earnings are taxed at a lower rate and shareholders receive a partial credit for taxes paid by the business corporation.

In England, France, and Japan, investors receive partial credits, in widely varying amounts, for taxes deemed to have been paid by the business enterprise.

All of these measures reduce, although they do not eliminate, the double taxation of business earnings.

There are any number of techniques that can be used to eliminate or reduce double taxation. We believe they should be considered in our country. At the same time, we recognize that the Government cannot now afford radical reductions in revenue.

We further recognize that the stimulative tax policies now in effect blunt the impact that otherwise comes about from our system of double taxation.

The obvious question is, how can the European nations afford to soften the impact of double taxation of business earnings?

There is no clear answer to this question. Nations have differing levels of public expenditures and differing yields from the various types of taxes. However, it would appear that one reason European nations can afford this reform is that they all impose broad consumption taxes.

In our view, the elimination of double taxation of business income deserves serious review, and we recommend that this committee undertake such a study of how such an objective might be achieved over the long term. The study should obviously include consideration of a consumption tax.

Now, finally, Mr. Chairman, I wish to comment on a subject that has not been touched, to my knowledge, in your hearings, or if touched, only very, very lightly. It was referred to by the chairman.

That is, the American system of supporting what is known as independent research and development.

Although not directly a responsibility of your Committee on Finance, it is a matter which is of great concern. It is the matter of independent research and development, referred to as IR&D.

United Technologies spends in excess of \$150 million every year in independent research and development. This is that portion of total research and development costs which is defined under Department of Defense procurement regulations as having military relevancy, as being within the ceiling negotiated, and as being allocable to the costs of producing both goods and services for the military and for commercial customers. A considerably greater amount above the ceiling is also expended by our company each year.

This research and development is performed by United Technologies to find new technologies and applications to extend existing ones, and to develop new products and processes. The costs are allocated to our commercial business and to our military business.

To the extent these costs are allocated to our commercial business, we recover the outlays through the prices we charge our commercial customers. It is the only way we can recover the costs.

Similarly, we expect to, and we do, recover the portion allocable to our military products and services in the prices we charge.

Under present regulations, the amount of IR&D costs must be and are closely monitored by the Department of Defense.

First, unlike in the commercial field, we explain to DOD experts the technical and financial details of our efforts. We include in the allocable costs only those for our endeavors which have military relevancy. Then, we negotiate a ceiling amount which is allocable, even though we do spend more than the negotiated ceiling amounts.

Language adopted by the 97th Congress seems to require that in fiscal year 1985 the Department of Defense is to set up a separate category of expense which represents the cost of all IR&D allocated to Government contracts by all companies. Then, in some manner, the language of last month's continuing resolution indicates that these expenses must be treated as a separate appropriations line item, which would be subject to the budget and appropriations actions of the Congress.

The intent seems to be to provide some sort of congressional control over IR&D expenditure levels.

We do not understand how such a process could be in the interests of our Nation. By their very nature, these expenses are incurred by companies using their own judgment, taking into account such factors as the state of current technology, possibilities for future advancement, and the needs of the marketplace. These costs can only be recovered in our prices. To place the costs in a separate line item could only serve to undermine the independent nature of the work performed, to the detriment of the defense and economic wellbeing of the Nation.

Let me respectfully suggest, Mr. Chairman, that this distinguished committee work with Senators serving on the Armed Services and the Appropriations Committees in reconsidering the independent research and development portion of the continuing resolution approved last month.

Senator CHAFEE. Did that come out of the Armed Services Committee or the Defense Subcommittee of the Appropriations Committee?

Mr. MACGREGOR. It is my information that the originating source was one or two members serving on the Appropriations Subcommittee on Defense of the House of Representatives, not the United States Senate.

Senator CHAFEE. Thank you. We'll take a look at that.

Mr. MACGREGOR. To my knowledge, Mr. Chairman, this issue, arising as it did very late in December 1982, and stemming from what we believe to be only very cursory consideration by the House Defense Appropriations Subcommittee, has never been debated in subcommittee or committee, or certainly on the floor of the Senate. It has not been considered by any body of the United States Senate, to our knowledge.

Senator CHAFEE. A lot of mischief in short sessions and late nights.

What is the single most important action? You gentlemen both represent giant companies. What's the single most important action the Government can take to spur new technology by your companies?

Your viewpoint is obviously somewhat different from the others who have testified, from the smaller or the mid-sized companies. What can we do to help you spur new technology? Would it be a cut in the corporate rate, or what?

Mr. ALLEN. Well, I think, given the choice between a cut in the corporate rate and special credits or deductions, I would opt for the cut in the corporate rate.

Special credits and deductions tend to come and go as fads change. They are always subject to being repealed or amended in some way, and I think a cut in the corporate rate has more permanence and one could depend on it in making one's investment analysis. So that would be my vote.

Senator CHAFEE. Mr. MacGregor?

Mr. MACGREGOR. Briefly, I would agree.

Senator CHAFEE. There has been a lot of testimony here about the training of workers and retraining. Both your companies, I suppose, do a lot in training your own people. Could you tell us what you do at TRW?

Mr. ALLEN. Well, we do have ongoing training programs—management intern programs, and production, and personnel. We have found marked differences between the States in terms of what they will do to help corporations train employees; I think particularly of some of the southeastern States.

Senator CHAFEE. Who does the best for you?

Mr. ALLEN. At the risk of offending some of my friends in other of the southeast States, I would say Georgia probably does the best job.

Senator CHAFEE. Do you mean that when you need somebody, you will train them under a certain program, but they will pay for the instructors?

Mr. ALLEN. Yes, they will even do the instructing themselves sometimes.

Senator CHAFEE. In your plants?

Mr. ALLEN. In their training centers.

Senator CHAFEE. In their training centers?

Mr. ALLEN. Yes, sir. We have built new plants, and the State will do the selection of the employees out of the people who have applied for jobs, train them in what we need, and then give us the ones who pass all their tests. It has been very, very helpful to us.

Senator CHAFEE. And the State just comes forward and does this?

Mr. ALLEN. Yes. It's obviously a quid pro quo for the fact that we are making a substantial investment in that State and creating jobs. And to help promote that kind of an investment, they do offer this training facility.

Senator CHAFEE. Suppose you already have the plant rather than setting up a new plant, and you are only planning to increase your employment. Would they do it then, too?

Mr. ALLEN. No, I think not. I think that would be pretty much our responsibility at that point. It's primarily the new investment and the new jobs that are being created.

Senator CHAFEE. Sort of the bait to get you to build the plant there?

Mr. ALLEN. Yes, sir. But it works very well.

Senator CHAFEE. How about you, Mr. MacGregor?

Mr. MACGREGOR. Our experiences have been the same. We also had very good support in our growing presence in the State of South Carolina, as well as Georgia.

We have excellent ongoing cooperative programs in our home State of Connecticut, where the bulk of our employees are. It's a very close and long-standing working relationship, a hands-on cooperative effort, with the State government in Connecticut, the educational departments of the State government in Connecticut.

I think our company is not unique in this, but we are very proud of the fact that a very substantial portion of our annual budget for charitable, educational, and cultural contributions is made to institutions of higher learning which seek to develop a greater number of well-qualified graduates in the sciences and in engineering and in physics.

Senator CHAFEE. Do you think the States should help big companies like yours?

Mr. MACGREGOR. I believe so. Again, this is a matter of public policy being developed partly by the States but also partly by the Federal Government.

The Federal Government recognizes and gives favorable tax treatment to certain endeavors by State governments to promote industrial development in those States. I know that is an issue that is somewhat controversial and may well be a matter of concern to you and members of your distinguished committee; but, yes, I think, in our sophisticated Federal system of government, where States have fairly defined responsibilities and in some degree are competing one with another, that within a pattern of fair play laid

out by the Congress of the United States I think the States have the right to seek to build a better economic future for that State and more employment for their citizens by recognized inducements to plant location. And corporations, by the same token, have an obligation when they are a citizen of a given State to be good citizens and to support the educational efforts of that State.

Senator CHAFEE. What do you say to that, Mr. Allen?

Mr. ALLEN. Well, I would generally support that. I think it is appropriate for States to offer incentives to corporations. They are in effect competing against other States for a scarce resource, and that's jobs. In competing for the creation of those jobs, I think it is perfectly appropriate for them to offer incentives.

Senator CHAFEE. Well, I appreciate your coming, gentlemen. Thank you very much for your testimony.

Mr. ALLEN. Thank you very much, Mr. Chairman.

Mr. MACGREGOR. Thank you.

[The prepared statement of Charles R. Allen and the letter from Robert M. Adams, 3M Co., follow:]

CHARLES R. ALLEN

TESTIMONY BEFORE THE SENATE FINANCE COMMITTEE,
SUBCOMMITTEE ON SAVINGS, PENSIONS, AND INVESTMENT POLICY HEARINGS
TO PROMOTE HIGH GROWTH INDUSTRIES AND U.S. COMPETITIVENESS

JANUARY 20, 1983

I am Charles R. Allen, Executive Vice President and Chief Financial Officer for TRW Inc., a worldwide company engaged in manufacture and service of high technology products with annual sales in excess of \$5 billion. In 1981 and 1982 our company-sponsored research and development was about \$91 million and \$120 million, respectively. We believe that the United States should promote a tax environment which allows high technology growth companies to be competitive in the world marketplace. Specifically, TRW supports tax incentives for research and development.

We are keenly aware of the importance of research and development both to our organization and the U.S. economy. As an investment in high technology and future job creation, it is an investment worthy of special protection. Consistent with this goal, the Economic Recovery Tax Act of 1981 made specific provision to foster technological innovation through U.S. based R&D. This included both the research and development tax credit and the two year moratorium on allocation of research and development expense under the 861 regulations for foreign tax credit purposes. By combining these two provisions in one tax bill, Congress fulfilled a principal objective of good legislation, and that is coordination. Since the moratorium period is coming to a close this year, the Congress must consider whether or not to extend the moratorium and thus the coordinated tax support of U.S. research and development.

The allocation of expense under the 861 regulations prior to the moratorium was clearly a disincentive to research and development. It effectively forced an arbitrary percentage of research and development expenditures to be allocated against foreign earnings. The foreign tax credit limitation was thus reduced, which equates to a loss of deduction. A worldwide company approaching its foreign tax credit limitation would find that each dollar of increased research and development expenditure would reduce some portion of its foreign tax credit. Under some circumstances the lost foreign tax credits could actually exceed the benefit of the research and development credit.

A basic purpose of the 861 regulations is to match revenue and expense by geographic source, that is, foreign versus U.S.--admittedly a difficult task. An implicit assumption of the allocation process is that research and development expense is incurred to generate royalty income both currently and in the future. Accordingly, prior to the moratorium, research and development expense was allocated on that basis. This concept does not conform to TRW's business practice. Research and development is incurred to generate sales income; royalty income represents marginal profit. In other words, royalties represent a way to reduce the cost of research and development, but are not the primary purpose of research and development. To deny a deduction for such expenditures through the foreign tax credit mechanism not only undermines our effort to encourage U.S. technological exploration, but seems to lack basis in equity. To the extent that non-U.S. subsidiaries take undue advantage of a U.S. parent company's technology (through insufficient royalties or expense reimbursement), Internal Revenue Code Section 482 is available to remedy the abuse.

Among the countries where TRW does business, the United States is unique in allocating research and development and thereby denying a deduction for research and development through the foreign tax credit mechanism. Many countries fully support research and development through tax and fiscal incentives. Particularly noteworthy are the arrangements in Canada and Japan. This both gives non-U.S. companies a competitive advantage and encourages a transfer of research and development outside the United States. While TRW has not consciously transferred major research and development projects to other countries to escape the detrimental tax impact, the lower costs outside the U.S. are not likely to be ignored over time. We have reason to believe that research and development investment in foreign markets by U.S. companies is in fact increasing faster than in U.S. markets. A permanent end to the allocation of research and development against foreign source income is an important first step in reversing this trend.

While true of the 861 regulations in general, computations for research and development were particularly onerous. The regulations provided a set of extremely complex rules. Despite the complexities of the calculation, the results are often absurd. For example, assume a U.S. company performs research and development on ballistic missiles. All of this research is performed within the United States. The only revenue reasonably anticipated from this research is also U.S. source. Various foreign subsidiaries of the same company produce an array of automotive engine parts (valves, piston, etc.). Since both the missiles and the engine parts falls within the same two digit Standard Industrial Class (SIC) code, transportation equipment, the regulations force the following: U.S. ballistic missile research is

allocated against the dividend income from the foreign subsidiaries producing engine parts. To a knowledgeable observer it is not clear how the missile research can possibly benefit engine parts production.

The regulations do provide for certain alternative computations to the broad grouping of missiles and engine parts. Unfortunately, the alternative computations are so cumbersome and complicated as to make their application extremely difficult. We have discussed this with other companies and are not aware of any which are able to avail themselves of this alternative computation. In my written statement I have submitted a simplified computation of the research and development allocation to demonstrate how the allocation process acts to reduce the deduction for research and development.

We understand that when Congress reconvenes, Senator Wallop will introduce legislation to make the moratorium on allocation permanent. We strongly urge the members of this subcommittee to support that legislation.

While the allocation of research and development under 861 regulations is an immediate problem because of the pending end to the two year moratorium, let me add just a few words on a related topic--the R&D tax credit. The legislation as enacted was for five years and is scheduled to expire at the end of 1985. It is difficult to recognize the benefits of this tax credit in long-term investment analysis when there is a lack of certainty about its future. The closer we get to 1986 the greater the impact of the termination date on our financial review. A permanent credit is more likely to generate the long-term capital that successful research and development requires.

Investment in high technology is critical to the future economic well being of our country and requires a committed long-term capital investment in research and development, particularly vis-a-vis other countries. As such, we would hope the federal government would nurture and protect this investment. The allocation of research and development against foreign source income is counterproductive. In addition, its administration is wasteful of resources and arbitrary in result. I urge that the moratorium be made permanent. Further, to reap maximum benefits of the R&D tax credit through long-term investment, I urge that this credit also become permanent.

Thank you .

Attachment

Foreign Tax Credit and Double Taxation

	\$10 of U.S. R&D Deductions Apportioned to Foreign Source Income (Present Law)			No U.S. R&D Deductions Apportioned to Foreign Source Income		
	<u>U.S. Source</u>	<u>Foreign Source</u>	<u>Total</u>	<u>U.S. Source</u>	<u>Foreign Source</u>	<u>Total</u>
Taxable Income before R&D	\$200	\$100*	\$300	\$200	\$100	\$300
U.S. R&D Deductions	<u>20</u>	<u>10</u>	<u>30</u>	<u>30</u>	<u>-0-</u>	<u>30</u>
Taxable Income	<u>\$180</u>	<u>\$ 90</u>	<u>\$270</u>	<u>\$170</u>	<u>\$100</u>	<u>\$270</u>
U.S. Tax on \$270 at 46 percent rate			\$124.2			\$124.2
Foreign Tax Paid on \$100 at 50 percent rate			50			50
Foreign Tax Credit allowable by U.S. authorities (46 percent U.S. rate x foreign source taxable income)			\$90 at 46 percent = <u>(41.4)</u>			\$100 at 46 percent = <u>(46)</u>
Total Taxes Paid			<u>\$132.8</u>			<u>\$128.2</u>

*Includes \$50 foreign tax paid

CLARK MACGREGOR
SENIOR VICE PRESIDENT
UNITED TECHNOLOGIES CORPORATION

STATEMENT

BEFORE THE SAVINGS, PENSIONS, AND INVESTMENT POLICY SUBCOMMITTEE

SENATE COMMITTEE ON FINANCE

JANUARY 20, 1983

Good morning. I am Clark MacGregor, Senior Vice President of United Technologies Corporation.

United Technologies designs, develops and manufactures products with high technology content. We are headquartered in Hartford, Connecticut. Our annual sales volume is 14 billion dollars.

Our Pratt & Whitney Aircraft Group produces commercial and military jet engines. Our engines power a large majority of the free world's commercial jet transport aircraft, and our military engines are used in a large number of aircraft, including the U.S. Air Force F-15 and F-16 aircraft and the Navy F-14.

Our Otis elevators and Carrier air conditioners are sold throughout the world.

Sikorsky Aircraft builds both commercial and military helicopters, including the U.S. Army's Black Hawk helicopter.

Our Mostek subsidiary designs and manufacturers semiconductor circuits, including the latest 64K dynamic random access memories, known as RAM's.

Other units produce aircraft propellers, electronic systems and components and building and telephone wire and cable.

Our annual exports to other countries, direct and indirect, exceed 2 billion dollars. We invest over 800 million dollars each year in research and development, and over 500 million dollars to keep our factories and equipment modern. We carry out our work with some 180,000 employees.

Like most companies, we are working hard to sustain ourselves and to grow in this increasingly competitive world.

Like you, we have an intense interest in public policies that will stimulate productivity, will enhance production of new products and services, and will gainfully employ all of our citizens.

Tax Policies - Near Term

Policies In Place Now

The country now has in place a number of tax provisions that have been designed by the Congress to stimulate investment and productivity. Some of these have been a part of our tax system for many years. Others have been recently enacted. All of them were extensively debated at the time of enactment, and many of them continue to be debated today. In view of the deficits, some of the benefits of these provisions have been cut back recently, and there are in the background discussions about those that remain in place.

We are hopeful that those provisions now in place will remain in the law.

In 1981, the Congress enacted the Accelerated Cost Recovery System, known as ACRS. This provision now allows the business community to recover the cost of machinery and equipment over a reasonable period of time. At the same time ACRS was adopted, the Congress enacted the 25% tax credit for R&D investments made up to 1985, to the extent that new investments exceed those made in previous years.

We believe these steps were essential to get our nation's industry back on the track.

In 1971, the Congress enacted DISC, the Domestic International Sales Corporation. The DISC permits deferral of income taxes that would otherwise be due on profits earned from exports of products to other countries. This was important legislation that stimulated exports then and continues to do so today.

In 1962, the investment tax credit was enacted. This credit was intended then to stimulate investment in plant, machinery and productive equipment. The credit did that then, and it does so today.

These are some of the past actions that have been taken which we believe continue to be necessary to restore our nation's industrial power.

Need To Keep Policies In Place Despite Deficit

Now for many complex reasons, we are faced with terrible government deficits. This factor has the potential of sapping the capital market's capacity to supply the financial resources needed by industry.

We have great concern that in the effort to reduce these deficits, there will be temptation to do away with those existing measures which are essential to restore growth, productivity and jobs. Such actions would be short-sighted, and deal a blow to those forces which are now in action to bring about the nation's recovery.

Already, some of the measures that were in place for many years have been recently revised. In 1982, the Congress revised the ACRS depreciation reforms that were to become effective in 1985 and 1986. You will recall that the 1985 and 1986 reforms were to have become effective in 1981, but were deferred at the last moment because it was considered that the government could not absorb the reduced revenues until later.

And now, the 1985 and 1986 reforms are lost. We did not agree then and we do not agree now that the 1981 deferral and the 1982 reversal were wise acts.

At the same time the depreciation reforms were lost, the 10% investment tax credit was cut back to 8%.

In 1976, DISC was cut back, so that the tax on profits only on incremental export sales was deferrable. In 1982, the DISC stimulus was cut back another 15%.

The R&D tax credit, unfortunately, has a built-in date for its demise.

Almost as unfortunate is the on-again off-again aspect of these actions. Aside from the substantive value of the measures, one must ask how the industrial community can plan for the future without reasonable stability in tax policy.

And now, action appears to be required again on DISC. The European members of the General Agreement on Tariff and Trade, GATT, have convinced that body that DISC is an inappropriate export stimulus, and the U.S. Trade Representative has agreed that the Administration will submit DISC revisions to the 98th Congress.

We believe it is possible to enact a DISC change which will be technically acceptable to the GATT and still provide proper export stimulus. In particular, we strongly believe that past deferrals of tax on export profits must be preserved and made permanent. These funds are now invested in export producing assets, as contemplated under the DISC legislation. The investments in these assets must be preserved. We believe that reasonable stimulus for future exports should be continued.

Foreign Tax Policy

I would like to say a few words about taxation of foreign income earned by American owned companies. It is the implicit if not stated policy of the United States that it is desirable for American companies to employ as many persons as possible in the United States, to import as few products as possible and to export as many as possible. Certainly, we support such a policy. Despite the desirability of these goals, we all recognize that relationships among industrial nations require a balance. It is not possible for one nation to be a substantial and permanent net exporter and all others to be substantial and permanent net importers. This fact requires American companies to have a major presence on foreign soil.

Present U.S. policy is to tax all income remitted to the United States regardless of source, with credit for foreign withholding taxes paid and foreign income taxes deemed to have been paid.

In addition, subpart F requires that certain passive income earned by U.S. owned foreign subsidiaries is to be taxed currently; that is, taxed before it is remitted to the U.S. Although this policy creates a greater burden than carried by some of our foreign competitors, we do not suggest at this time that any changes should be made in U.S. foreign tax policy.

By this, we mean that the "taxation before remittance" concept of subpart F should be neither expanded nor contracted. At a time of national deficit

and unemployment, suggestions are expected to be made to the effect that earnings of U.S. owned foreign subsidiaries should be currently taxed, before the profits are remitted to the U.S. To preserve the present levels of worldwide competitive posture of U.S. companies, such suggestions must be resisted.

We note that some U.S. tax rules actually serve to stimulate the export of jobs.

In particular, we have in mind Section 1.861-8 of the Income Tax Regulations issued by the Treasury in 1977. The Internal Revenue Code has long provided that foreign source income must be reduced by an allocation of expenses incurred in the United States. In the 1977 regulations, it became required that substantial amounts of research and development costs spent in the United States had to be deducted against foreign source income. This in turn reduced the foreign tax credit.

The net effect is that certain R&D costs incurred in the United States are not deductible for U.S. federal income tax purposes.

One way a company could avoid this penalty would be to transfer its R&D operations to a country which allows a tax deduction.

In recognition of this problem, the Congress suspended the IRS regulations

in the 1981 Tax Act for the years 1982 and 1983. At the same time, Treasury was to study this matter and to report to the Congress. To our knowledge, no such report has yet been made.

We strongly urge that this problem be resolved quickly, and that the Congress act to suspend the regulations permanently. It is wrong to have a tax policy which has the potential of discouraging R&D efforts in the United States.

Action is required before the suspension expires at the end of this year.

We also take note that the 1982 Tax Amendments dealt blows to companies' ability to retain funds for working capital. The amendments have speeded up corporate estimated tax payments.

Now, a company must have paid 90% of its taxes by December 15. The penalty for underpayment is so high that a company cannot afford to underpay. The standard of forecasting accuracy that is demanded by this amendment is, frankly, beyond the capability of most companies.

Such trends should not be allowed to continue.

The above observations are, in our view, applicable in the near term. That is, further erosion of sensible provisions must not occur. ACRS

must be preserved. Consideration should be given to restoring the provisions that were included in the 1981 Act. The R&D tax credit must be preserved and must be made permanent.

IRS must not be allowed to diminish this credit through over-reaching regulations. Independent research and development costs which are allocated to government contracts must be eligible for the credit. This is because a substantial portion of the independent research and development costs are allocated to commercial business and are recoverable only in prices charged to commercial customers. Even for the portion allocated to fixed price military business, the companies are at risk, and to this extent the R&D allocated to military business is no different than any other R&D. Investments in R&D must be promoted by the tax laws, not discouraged.

The DISC concept must be preserved, and export resources must not be drained away through taxation of previously deferred export profits. And, the §1.861-8 regulations relating to R&D costs must be permanently suspended.

Restoration of the full investment tax credit would be highly desirable in our view. Cash management relief is also desirable if not essential.

Tax Policies - Long TermDouble Taxation

Longer-term actions may be required. New proposals that might provide further stimulation of productivity cannot be adopted at this time if the effect is to widen the Government's deficit.

Nevertheless, it is a fact that the United States policy is to tax business earnings twice. First, a 46% tax is imposed at the corporate level, plus, of course, state income taxes.

Then, when the earnings are distributed to the share owners who have supplied the capital, the earnings are taxed again, up to 50%.

This means that investors ultimately keep 25 cents on a dollar of business earnings. On top of that, increases in the value of a shareholding are taxed - up to 50% if the holding was for less than a year. Under such a burden, one wonders what it is in our economic system that permits the capital markets to operate as well as they have.

Many of our foreign competitors do not operate under such systems. In Germany, distributed earnings are taxed at a lower rate and shareholders receive a partial credit for taxes paid by the business corporation. In England, France, and Japan, investors receive partial credits, in widely varying amounts, for taxes deemed to have been paid by the business enterprise.

All these measures reduce, although they do not eliminate, double taxation of business earnings.

There are any number of techniques that can be used to eliminate or reduce double taxation. We believe they should be considered in this country. At the same time, we recognize that the Government cannot now afford radical reductions in revenue. We further recognize that the stimulative tax policies now in effect blunt the impact that otherwise comes about from our system of double taxation.

An obvious question is, how can the European nations afford to soften the impact of double taxation of business earnings? There is no clear answer to this question. Nations have differing levels of public expenditures and differing yields from the various types of taxes. However, it would appear that one reason European nations can afford this reform is that they all impose broad consumption taxes.

In our view, the elimination of double taxation of business income deserves serious review, and we recommend that this committee undertake such a study of how such an objective might be achieved over the long term. The study should also include consideration of a consumption tax.

Independent Research and Development

Although not directly a responsibility of your committee, there is yet

another matter which is of great concern to us. It is the matter of independent research and development, referred to as IR&D. United Technologies spends in excess of 150 million dollars every year in independent research and development. This is that portion of total research and development costs which is defined under DoD procurement regulations as having military relevancy, as being within the ceiling negotiated, and as being allocable to the costs of producing both goods and services for the military and for commercial customers. A considerably greater amount above the ceiling is also expended each year.

This R&D is performed by United to find new technologies and applications to extend existing ones, and to develop new products and processes. The costs are allocated to our commercial business and to our military business.

To the extent these costs are allocated to our commercial business, we recover the outlays through the prices we charge our commercial customers. It is the only way we can recover the costs.

Similarly, we expect to and do recover the portion allocable to our military products and services in the prices we charge. Under present regulations, the amount of IR&D costs must be and are monitored by DoD. First, unlike in the commercial field, we explain to DoD experts the technical and financial details of our efforts. We include in the

allocable costs only those for endeavors which have military relevancy. Then, we negotiate a ceiling amount which is allocable, even though we do spend more than the negotiated ceiling amounts. Except to the extent limited by this procedure, we then recover these costs in our military prices.

Language adopted by the 97th Congress seems to require, that in FY 1985, DoD is to set up a separate category of expense which represents the cost of all IR&D allocated to government contracts by all companies. Then, in some manner, the language indicates these expenses would be treated as a separate appropriations line item, which would be subject to the budget and appropriations actions of the Congress.

The intent seems to be to provide some sort of congressional control over IR&D expenditure levels.

We do not understand how such a process could be in the interests of the nation. By their very nature, these expenses are incurred by companies using their own judgment, taking into account such factors as the state of current technology, possibilities for future advancement, and the needs of the market place. These costs can only be recovered in our prices. To place the costs in a separate line item could only serve to undermine the independent nature of the work performed, to the detriment of the defense and economic well-being of the nation.

Mr. Chairman, and Members of the Subcommittee, I want to thank you for the opportunity in expressing the foregoing views.

General Offices/3M

3M Center
St. Paul, Minnesota 55144
612/733 1110

January 13, 1983



Senator John H. Chafee
Chairman, Subcommittee on Savings, Pensions,
and Investment Policy
Room 5229, Dirksen Building
Washington, D. C. 20007

Dear Senator Chafee:

Your staff has invited comments at hearings you propose to hold in Washington on January 19 and 20. While it is not possible for us to be present at those hearings, we welcome the opportunity to highlight some of the issues which we believe to be important in encouraging the healthy growth of companies involved in high technology, innovation, and international trade.

The last Congress made a good start in encouraging innovation and new technology by granting tax credits to companies based upon increased spending in R. & D. In the case of our own company, these credits have encouraged additional investments in R. & D. Since research and development is a long-term investment, we need to retain these credits in order to obtain maximum benefit.

A positive result of innovation and new product development is the opportunity to sell such products overseas. As you know, the recent strength of the dollar has priced such products unfavorably in the international market. Competition reacts very quickly these days, and even our newest products are soon imitated. Consequently, actions and policies such as DISCS make it easier to do export business and are helpful to U.S. industry. In addition, policies designed to further protect American intellectual property in the international arena should be encouraged. Of course, success in exports also improves the U.S. balance of payments.

A subject of long standing is Government policy toward patents obtained as a result of Government contracts or of the Government's own efforts in such places as the National Laboratories. Millions of words have been written on this subject. Basically, the question is how a company can protect its substantial investment in development, plant construction, and marketing if it does not have title to appropriate patents or have at least some lead time under an exclusive license. Interest in the output of the National Laboratories and the laboratories of the Defense Department has increased recently but is likely to come to naught without a more pragmatic approach by the Government to patent ownership and licensing. The approach taken by the Senate Commerce Committee during the 97th Congress was a good start and should be energetically pursued.

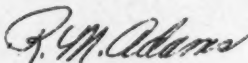
I know you are aware that the costs of R. & D. are very high. There are, in fact, some worthwhile projects which simply cannot be funded by one company. Even where financing might be arranged, the projects' objectives are so broad that no one company has the required expertise for all aspects of a project. Japan, France, and some other countries encourage developments in such fields through antitrust policies which permit cooperative R. & D. programs without raising delaying questions of antitrust. We have been pleased to note one instance in the U.S. information processing industry indicating some relaxation of the Government's previously unyielding attitude on cooperation between companies. Also encouraging was last year's consideration by the Senate Judiciary Committee of several bills including S.2717, the Antitrust Joint Research Act of 1982. I hope the trend continues.

One other area at which your subcommittee might like to look is the relationship between industry and our universities. With the sharp decrease in Government funding, universities are looking to industry for support. At the same time industry recognizes the value of the fundamental research by universities which feeds commercial opportunities. I am not sure that legislation or Government policy needs to become involved in this growing association. Nevertheless, your committee might help to air some of the issues. Certainly a good relationship between the producers of fundamental research and the developers of commercial technology is important to the future of our economy.

Finally, I would like to recommend that your staff contact the Industrial Research Institute who have studied this entire subject closely and who might be able to offer considerable detailed input. The Executive Director of I.R.I. is Mr. Charles F. Larson, Industrial Research Institute, Inc., 100 Park Avenue, Suite 2209, New York, New York 10017; telephone [212]-683-7626.

Thank you for this opportunity to call to your attention some of the subject matter which we feel to be important in stimulating innovation and associated economic growth.

Sincerely yours,



Robert M. Adams
Senior Vice President
Technology Services
3M
Saint Paul, Minnesota

RMA:va

[Whereupon, at 1:38 p.m., the hearing was concluded.]
[By direction of the chairman the following communications were made a part of the hearing record:]



Suite 700
1825 Eye Street, N.W.
Washington, D.C. 20006
202-785-7400, 785-7416

Clark MacGregor
Senior Vice President

January 21, 1983

Mr. Robert E. Lighthizer
Chief Counsel, Committee on Finance
United States Senate
Washington, D.C. 20510

Dear Bob:

In accordance with our discussions following the hearings of the Committee on Finance on January 20, I am forwarding several papers dealing with the actions of the Congress on Independent Research & Development/Bid & Proposal.

Attachment A is a reprint of Section 790. of H.J. Res. 631, Appropriations for FY'83, as well as a reprint of the paragraph concerning IR&D/B&P in the conference report.

Attachment B explains the need for IR&D/B&P and the strong support given to this effort by the Department of Defense. It also discusses the controls placed on the administration of IR&D/B&P by that department in accordance with previous legislation. It concludes with an analysis of the very negative effects which would result from an arbitrary "cap" on the amount of IR&D/B&P cost to be allowed defense contractors.

Attachment C is a discussion of the costs incurred by contractors, and the extensive procedures used by defense officials to monitor and control these costs, including IR&D/B&P. The attachment notes that the thousands of actions needed to perform this control are appropriately an Executive Branch function, rather than a Legislative Branch function.

If we at UTC can be of further assistance, please contact Hugh Witt, Vice President for Government Liaison, here in our Washington office. His telephone number is 785-7411.

We appreciate the opportunity to present our position to the Committee on Finance, and I sincerely trust you can help bring a more reasoned approach to Congressional oversight of IR&D/B&P.

Clark

Clark MacGregor

Attachments

POWER
Pratt & Whitney
Eliot
Power Systems
International Support Systems
BUILDING SYSTEMS
Otis Elevator
Carrier Air Conditioning
Building Automation
ELECTRONICS
Mott
Essex
Automotive
Hamilton Standard
Norden Systems
Microelectronics Center
INMONT
SUKORSKY
RESEARCH CENTER

97TH CONGRESS }
2d Session }

HOUSE OF REPRESENTATIVES

REPORT
No. 97-980

MAKING FURTHER CONTINUING APPROPRIATIONS AND PROVIDING FOR
PRODUCTIVE EMPLOYMENT FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1983

DECEMBER 20 (legislative day of DECEMBER 19), 1982.—Ordered to be printed

Mr. WHITTEN, from the committee of conference,
submitted the following

CONFERENCE REPORT

[To accompany H.J. Res. 651]

SEC. 790. Notwithstanding the budget authority levels provided in title IV of this Act for the procurement appropriation accounts, the sum total of such budget authority levels is hereby reduced by \$386,000,000: Provided, That not more than \$2,100,000,000 of the remaining budget authority provided in title IV of this Act and as further reduced herein for the procurement appropriation accounts may be obligated or expended to pay independent research and development and bid and proposal costs allocated to procurement contracts as items of indirect expense.

INDEPENDENT RESEARCH AND DEVELOPMENT AND BID AND PROPOSAL
COSTS

The conferees share the concern expressed by the House over visibility and accountability of Independent Research and Development (IR&D) and Bid and Proposal (B&P) costs. The House directed, as a result of those concerns, that IR&D and B&P be carried as line items in the budget starting with the fiscal year 1984 budget. The Department has stated that, because of the time element, implementation of this directive will work hardship. The conferees therefore modify the House directive as follows: (1) The Department is directed to submit not later than April 1, 1983, an annex to the fiscal year 1984 budget which proposes the total ceilings for fiscal year 1984 for negotiated IR&D costs and for negotiated B&P costs, by Service. The Committees on Appropriations will review and approve or modify the proposed ceilings. The Department will subsequently ensure that the sum totals of negotiated IR&D and B&P costs remain within the Committee approved ceilings. (2) The Department is directed to begin carrying IR&D and B&P costs as line items in the fiscal year 1985 budget, provided that hearings do not show conclusively that line item budgeting will be counterproductive.

Independent Research and Development/Bid & ProposalBackground

The Congress and the President have repeatedly emphasized the importance of research and development to this nation's technical leadership, especially now when that leadership is being repeatedly challenged by foreign nations. Research and development is essential to rebuilding our lead in industrial productivity.

The most important segment of our R & D efforts is that required to maintain our dominance in weapons technology and the preservation of a reliable industrial defense base. The protection of the U.S. is obviously our highest priority.

The Department of Defense (DOD) supports these R & D efforts in two basic ways: (1) direct contracts with industry and academia, and (2) DOD research laboratory programs. Each of these approaches has a vital function to perform in assuring a balanced national R & D national effort. Direct contracts and in-house laboratory programs consist of specific research efforts clearly set forth as line items in the DOD budget. This means that such efforts have been precisely identified by the DOD.

IR&D/B&P is uniquely different. As a customer, the DOD does not buy IR&D/B&P. Instead, it buys weapons or other hardware, the prices of which contain a proportionate share of all indirect costs, including IR&D/B&P. This is based on the plain fact that all firms must recover the costs of their sales, including R & D work and the expense of making bids and proposals in response to requests from the DOD.

It is important to emphasize that independent R&D is precisely that--"independent" work by a contractor, meaning he applies his resources to those technologies in which his capabilities are highest. Unlike the other kinds of government-supported R&D, the specific tasks are not chosen by the DOD, but by the contractor. This assures the best application of the truly innovative resources available in industry.

One of the most productive results of IR & D/B & P is the encouragement of competition among U.S. contractors. The DOD benefits by being assured of a wide range of producers and lower prices for their products.

The value, importance and necessity of IR & D and B & P have been accepted by the Commission on Government Procurement, the General Accounting Office, the Department of Defense, the National Aeronautics and Space Administration, Congress and the industrial community.

The DOD has developed over many years a sophisticated set of administrative procedures covering IR&D/B&P. These procedures comply with the direction of the Congress as expressed in P.L. 91-441. This law requires, for instance, an agreement in advance (by the DOD and the larger contractors) which limits the total cost of IR&D/B&P recovered by the contractor in prices of products to be sold during the year. Smaller

businesses are provided a simplified procedure which does not require the complex documentation of an advance agreement.

Section 790 of P.L. 97-377 limited the dollars that the DOD could "obligate or expend for IR&D/B&P" in the price of products or service it buys from defense contractors. This limitation serves, in effect, as a "cap" on the IR&D/B&P funding.

Effect of a "cap"

This mandated "cap" arbitrarily set by the Congress substantially reduces the amount of IR&D/B&P effort to be recognized by the DOD as an allowable cost of defense contracts. This action negates many of the advantages of IR&D/B&P. The cap would:

- (1) Reduce the level of technical competition as well as price competition.
- (2) Reduce the industrial base needed for our defense effort.
- (3) Discourage industry, both large and small, from participation in DOD contracts.
- (4) Add extensive paperwork, especially for the small businessman.
- (5) Slow down efforts to regain our technological leadship among the world's industrial nations.

Under current procedures, the contractor recovers only part of the cost of his IR&D efforts. Further reduction of such recovery, resulting from the Congressional cap, would force a reduction of technical effort by contractors. This, in turn, would result in fewer contractors qualified to respond to requests for high technology proposals.

Bid and proposal funds, which are about one-half of the funds affected by the cap, are spent to provide the DOD with proposals from firms competing for defense contracts. The Congressional cap would further decrease the amount of recoverable funds for this purpose and would inevitably reduce the number of businesses seeking defense contracts.

The inability to recover these costs will reduce industry's motivation to be defense contractors. This means that fewer firms will be available as members of the industrial base to meet a national emergency.

As noted earlier, IR&D/B&P is one of the most important contributors to our total national R&D effort. If we are to regain our role of technological leadership, no reduction of IR&D/B&P funds, as mandated by the Congress, must be permitted.

attachment 2

The Involvement of Congress in Independent R&D/Bid & Proposal

A contractor's costs consist of many items, all of which must be recovered for him to stay in business. Included among these costs are:

1. factory labor costs
2. clerical costs
3. scientific and engineering costs
4. independent R&D//B&P
5. management costs
6. material costs paid to suppliers
7. purchased parts costs paid to suppliers
8. telephone costs
9. electricity costs
10. gas costs
11. local and state tax costs
12. transportation costs

These costs are reviewed by the DOD auditors and contract administrators responsible for assuring that such costs are reasonable and that they have been established in accord with accepted industry costing procedures.

Before entering into a sizable or complex procurement, the procuring activity will request a cost/technical analysis of the reasonableness of the proposal. On major programs procured under cost reimbursement or fixed-price incentive contracts a requirement will normally be imposed to meet the Cost/Schedule Control Systems Criteria. These criteria establish standards of acceptability for the contractor's internal-cost/schedule-control system and require submission by the contractor of cost performance reports, which are summaries of cost and schedule information. If the program manager considers it necessary, he asks the contractor to go into greater detail on certain areas of his cost performance reports. Such monitoring controls provide a basis for close and continuous control over a major program schedule.

Contract audits are carried out by the Defense Contract Audit Agency to aid in pricing, and to review and recommend to the contracting officers the action they should take on contractors' vouchers submitted for reimbursement. Auditors examine actual and estimated costs to the extent necessary in view of the contractor's procedures and practices.

The DCAA reviews the contractors' estimating systems, since adherence to a sound system reduces the scope of the proposal review to be performed by the audit and technical personnel. The DCAA also certifies acceptable costs to the contracting officer for payment. During the negotiation of a proposed contract, the DOD has a preaward accounting survey performed to learn the contractor's method of cost accounting.

Thus, the DCAA, consisting of 3,600 personnel, and the DOD contract administrators perform in-depth reviews and audits of contractors' costs to assure protection of the government's interests. This involves thousands of contracts and hundreds of thousands of transactions, performed by personnel who have been trained in the many sophisticated procedures involved in government contracting and record-keeping. The DCAA issues over 66,000 audit reports annually. Auditing contractors' accounts and records is their sole, very specialized, occupation.

This entire function is one that is appropriately performed by the operating arm of the government, the Executive branch.

Congressional Involvement

From the discussion above, it is obvious that the Legislative branch, i.e., the Congress, cannot possibly become intimately involved in the details of determining the accuracy and allowability of the many costs incurred by government contractors. Members of Congress are not equipped to do so and certainly do not have the expertise to make judgments in this specialized field.

It can certainly be argued that it is most questionable, and even counter-productive, for the Congress to become involved in one individual segment of contractors' costs to the extent that funds are arbitrarily reduced and a ceiling placed on that segment without at least a reasoned and thoughtful review of the way the Executive branch is conducting its business. This is what has happened to IR&D/B&P through the passage of the DOD FY'83 Appropriations Act.

On the other hand, the Congress, in its oversight role should appropriately assure itself that the broad area of all contractor costs is being reviewed and monitored by qualified government employees following sound practices, and operating with Congressional guidance at the policy level.

Attachment

Foreign Tax Credit and Double Taxation

	\$10 of U.S. R&D Deductions Apportioned to Foreign Source Income (Present Law)			No U.S. R&D Deductions Apportioned to Foreign Source Income		
	U.S. Source	Foreign Source	Total	U.S. Source	Foreign Source	Total
Taxable Income before R&D	\$200	\$100*	\$300	\$200	\$100	\$300
U.S. R&D Deductions	<u>20</u>	<u>10</u>	<u>30</u>	<u>30</u>	<u>-0-</u>	<u>30</u>
Taxable Income	<u>\$180</u>	<u>\$ 90</u>	<u>\$270</u>	<u>\$170</u>	<u>\$100</u>	<u>\$270</u>
U.S. Tax on \$270 at 46 percent rate			\$124.2			\$124.2
Foreign Tax Paid on \$100 at 50 percent rate			50			50
Foreign Tax Credit allowable by U.S. authorities (46 percent U.S. rate x foreign source taxable income)			\$90 at 46 percent = <u>(41.4)</u>			\$100 at 46 percent = <u>(46)</u>
Total Taxes Paid			<u>\$132.8</u>			<u>\$128.2</u>

*Includes \$50 foreign tax paid



ARCS Foundation, Inc.

ACHIEVEMENT REWARDS FOR COLLEGE SCIENTISTS
Metropolitan Washington Chapter, Washington, D. C.

January 31, 1983

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Mr. Clark MacGregor
Senior Vice President
United Technologies Corporation
1825 Eye Street, N. W.
Washington, D. C. 20006

Dear Mr. MacGregor:

I am certain that you are fully aware of the pressing national need for additional engineers and scientists. The recent proliferation of high technology companies in the Washington area has made this a local as well as a national problem. The Metropolitan Chapter of the ARCS Foundation is beginning its fourteenth year of providing scholarship funding to outstanding graduate-level college scientists and we need your support.

The Metropolitan Chapter of the ARCS Foundation is a non-profit organization whose sole purpose it is to provide funds to The Johns Hopkins University, Georgetown University and The George Washington University which, in turn, select outstanding students from any of the scientific disciplines to receive ARCS Scholarships. One hundred percent of all contributions received by ARCS are made available for these scholarships which, over the past fourteen years, have amounted to over a quarter of a million dollars. This year, with graduate-level education costs sky-rocketing and the availability of federal assistance plummeting, corporate and personal giving is critical if American technology is to maintain its preeminence in increasingly competitive world markets.

For these reasons, I would appreciate it if you would include ARCS among those organizations to which your company makes charitable contributions. Your support will be formally recognized in the program of our annual Spring Benefit to be held on April 9, 1983 at the Mayflower Hotel in Washington, D. C. The enclosed material may provide some additional encouragement and information about ARCS. Please make checks payable to: ARCS Foundation, Inc. Metropolitan Washington Chapter.

Thank you for your consideration of this request.

Sincerely,

Barbara Park Cantus
Director, Corporate Programs

1173 Huntover Court
McLean, Virginia 22102
(703) 356-8697

U. S. SENATOR ARLEN SPECTER

STATEMENT FOR HEARING

ON

THE PROMOTION OF HIGH-GROWTH INDUSTRIES

Mr. Chairman:

I am pleased to have this opportunity to contribute to these important hearings. I commend the Subcommittee for conducting these proceedings and analyzing this critical matter. This is a positive step towards understanding and encouraging this nation's developing high technology industries.

We all agree that Congress must become more familiar with High Technology and its applications. Each day, the lives of Americans are touched intimately with computer-based technologies and we can only expect this relationship to become more pervasive in future years.

While many facets of high technology need to be examined, I am most concerned about the effect it has had, and will continue to have, upon this nation's work force. Approximately two-thirds of America's 12 million unemployed are casualties of structural changes in our economy. Service-oriented businesses are picking up the slack from this country's declining manufacturing industry. Bewildered by this technological revolution, some workers do not welcome the change to more efficient production processes and communications systems. They believe this transition can only exacerbate our current economic woes. This conception is incorrect. It has been found that most healthy industries employing advanced technology will actually realize reduced costs as they increase demand and create new products

and services which will stimulate employment. In fact, high technology is expected to generate more than one million jobs nationwide within the next few years.

The belief that advanced technology is bad for employment is a harmful misconception. This incorrect view may be responsible for our lacking any effective policy for harnessing this nation's greatest developing resource. As a result, there is an acute shortage of skilled labor to meet the demand of high technology. Major revisions in the scale and configuration of America's education and training philosophy and operations may be required.

That the United States is experiencing a dual problem of high unemployment and a shortage of skilled labor in important sectors of the work force demonstrates the need for a national strategy. I am encouraged by the various retraining programs planned and operating in Allegheny County, Pennsylvania and the work being done at Carnegie-Mellon University in robotics research. We will derive valuable information from these and other pioneer projects in progress around the country. In addition to worker retraining, it is important that we recognize the need for education that will help to develop essential technical and computer skills in our school-aged youth.

We must commit ourselves to understanding how this nation can best coordinate the excess resources of our labor force with the urgent need for labor, skilled for managing, operating, and servicing high technology. I am hopeful that the 98th

Congress will not only address the immediate structural unemployment problem but will also construct a responsible strategy for meeting the demands for technically skilled labor. I will be introducing a bill in the near future that will propose the establishment of a national commission on high technology and employment potential. If enacted, this commission will employ the knowledge of business, labor, and academicians in forging a long-term national plan to accommodate advanced technology.

As we examine ways to promote the emergence of high-growth industries based on new technologies in today's hearings, I urge my colleagues to consider the present state and further potential of America's labor resources.

DIASONICS, INC.

1545 BARBER LANE MILPITAS, CA 95035 (408) 948-9001 TELEX NO. 9105382178

February 1, 1983

Mr. Robert E. Lighthizer, Chief Counsel
Committee on Finance, Room 2227
Dirksen Senate Office Building
Washington, D.C. 20510

Dear Sir:

I welcome the opportunity to express Diasonics' view concerning government policies to encourage the emergence of high-growth industries based on new technologies.

HISTORY

Diasonics, Inc. was incorporated in December 1978 and manufactures medical diagnostic imaging equipment which emphasizes the application of computer and image processing technology to selected diagnostic imaging markets. The company is a leading supplier of ultrasound imaging systems to radiologists and cardiologists in addition to being a major supplier of add-on digital x-ray systems.

Diasonics, Inc. generally sells and services its products directly in the United States and in Western Europe, Australia, and Japan through wholly owned subsidiaries. The company has independent distributors in 18 other foreign countries.

The company's objective is to achieve a leadership position in selected medical imaging markets where technological innovation can create market growth through new and enhanced diagnostic procedures. To minimize the risk of technological obsolescence, a major customer concern, the company's ultrasound and digital x-ray products are designed to be expandable and upgradable in the field through the addition of dedicated modules at a reasonable cost.

Selected financial data of the company is as follows:

(In Thousands of Dollars except Employees)

	1978	1979	1980	1981	1982
Sales	--	\$,897	\$1,671	\$2,038	\$3,370
Net Income (Loss)	(934)	(340)	2,272	5,947	12,225
Research and Development	473	617	1,823	4,605	10,103
Employees	*	*	283	771	1,352

*Not available.

This impressive growth rate has been directly tied to the company's commitment to its investment in research and development, which has led to significant increases in employment.

X-B:39

GENERAL PRODUCT STATEMENT

Diagnostic imaging systems are increasingly utilized to diagnose disease and injuries and to plan therapy. Several factors have contributed to this increase. The systems facilitate the diagnosis of disease and disorders at an early stage, often minimizing the amount and cost of care needed to stabilize or cure the patient, and frequently obviating the need for invasive diagnostic procedures, such as exploratory surgery. In addition, the diagnosis can often be performed on an outpatient basis, thereby eliminating the need for hospitalization. Further, the incorporation of new computer technology has permitted the introduction of new medical imaging systems with superior price/performance characteristics.

All diagnostic imaging systems are based upon the ability of energy waves to penetrate human tissue and to be detected by either photographic film or electronic devices for presentation of an image on a television monitor. Four different kinds of energy waves—x-ray, gamma, sonic, and radio—are used in medical imaging, the first two of which involve ionizing radiation which may be harmful to the patient.

SUMMARY OF PROPOSALS TO FURTHER HIGH TECHNOLOGY COMPANIES

The continued growth of Dasonics, Inc. depends on research and development which leads to new diagnostic systems. These products are, in many cases, critical to the early diagnosis of disease and disorders. In many cases, the research and development is performed in-house and/or with universities.

It is the opinion of Dasonics, Inc. that the following actions should be taken:

1. Eliminate the research and development tax credit "sunset provision."
2. Eliminate the incremental rule on research projects granted to universities.
3. Eliminate the 65 percent rule on research projects granted to universities.
4. Eliminate the manufacturing requirement on equipment donations to universities.
5. Continuation of export incentives.

DISCUSSION OF PROPOSALS

1. Eliminate Research and Development tax credit sunset provision.

The tax credit provided for qualified research and development is due to expire on December 31, 1985. As this date approaches, the expiration becomes a disincentive to conduct large research and development projects over a number of years.

2. Eliminate the incremental rule on research projects granted to universities.

As an additional incentive to increase university basic research, it may be advantageous to exclude research and development grants to universities from any base period amount. Since the present rule permits a 25 percent tax credit for qualified research and development above a base period amount, then by eliminating university grants from the base period, a company would receive a greater benefit by utilizing basic university research. The university would also benefit through involvement in more research activities.

3. Eliminate the 65 percent rule on research projects granted to universities.

The requirement that the 25 percent research and development tax credit applies only to 65 percent of basic university research provides a company with no additional incentive to use a university for basic research. The current law could be adjusted to provide that the 25 percent tax credit applies to the full amount of payments for basic university research.

4. Eliminate the manufacturing requirement on equipment donations to universities.

Current tax law provides for an additional contribution deduction for equipment donated to universities if the equipment was manufactured by the donor. In the electronic medical field, most equipment is assembled by unrelated parties because it is the most cost effective method of producing a product. Since the intent of the law is to give an incentive to industry to donate equipment to universities, it would be beneficial to eliminate the manufacturing requirement since the electronics industry does not manufacture in the true sense of the word.

5. Continuation of export incentives.

The company has been dependent on international revenue as a major source of income as shown by the following chart:

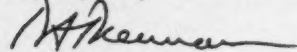
<u>Year</u>	<u>Export Sales</u>	<u>Percent of Revenue</u>
1980	\$12,686,000	40%
1981	\$17,996,000	25%
1982	\$15,147,000	11%

The deterioration of export sales as a percentage of revenue is due, in large part, to the development of new products in 1981 and 1982, which have not been marketed widely outside the United States. These products will be marketed widely outside the United States in 1983. The international market is very difficult due to import and other restrictions on the medical industry.

Any export incentive (DISC or its replacement), which the United States Government can provide, would help to defray the cost of selling a product in the international market.

I hope that this correspondence will assist your Committee in developing policies to encourage high-growth companies to continue to forge ahead with the latest technology.

Very truly yours,



David A. Drennan
Treasurer

DAD:jp



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January 6, 1983

Senator John H. Chafee
Chairman, Subcommittee on Savings,
Pensions, and Investment Policy
Senate Committee on Finance
2227 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senator Chafee:

As suggested in the press release, P.R.#82-178, I am supplying comments relative to innovation in the United States. First, I would like to summarize some of my literature readings and then suggest needs of industry and how government might assist to fill these needs.

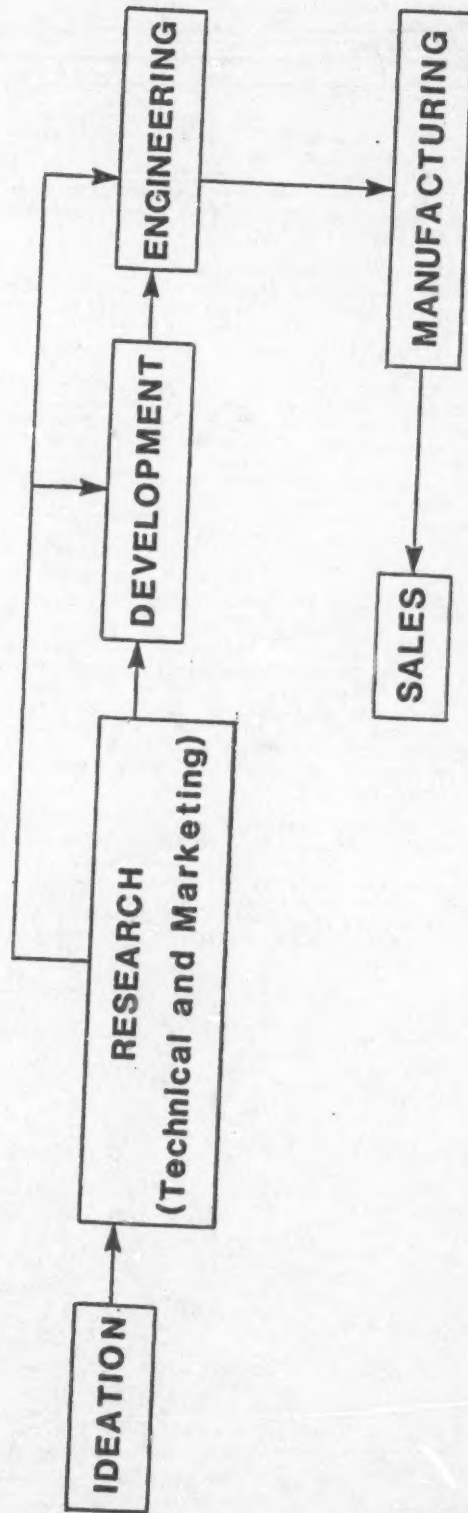
Innovation is, of course, the total process from creation of an idea to sale of a product or process. It, therefore, includes many steps, functions, and organizational units within a company. There is often the necessity of technology transfer from step-to-step or organizational unit-to-unit, each transfer having some probability of success. Multiplication of probabilities generally suggests a small chance for success of any innovation.

My concept of the innovation pipeline is shown in the figure. You don't get it started without an idea and, once started, you have discontinuities to overcome at each stage of development.

Examples of major scientific developments¹ such as the airplane, the laser, microprocessors, and the pacemaker had their genesis in someone's R&D group. R&D has been shown to contribute to the potential for national growth^{2,3} and to have various intangible benefits⁴. It is a mechanism by which a company can adapt to environmental changes⁵.

Starting with Robert Solow⁶ in 1957, national and industrial productivity has been related, at least in part, to advances in science and engineering. Sekulow⁷ says that innovation stimulates productivity and investment and investment, in turn, stimulates inventive and innovative activity. Firms with a good track record of innovation have substantially higher productivity and growth rate⁸. Technological innovation has a pronounced favorable impact on growth of GNP⁹.

THE INNOVATION PIPELINE



The decline in innovation in the U.S. and its impact has been well documented^{8,10-12}. Nason¹³ has reviewed the importance of innovation and environmental factors bringing about its decline. Yet, he also points out that whereas the total dollars for R&D are increasing, the allotment for more new product and new process R&D is decreasing.

Sekulow⁷ suggested that public policies discourage capital investment and cause some shift of R&D to more defensive, short-term goals. He suggested changes in tax, regulatory, and patent policies. Horan¹⁰ proposed like changes plus the expansion of support for basic research. Others have studied/found the same kinds of relationships^{9,14}.

From the foregoing, one would gather that there could be some constructive changes in public policies giving greater incentive to innovate. However, having a technical background, I'd like to concentrate on those technical facets whereby government assistance may be either beneficial or not beneficial.

The innovation pipeline doesn't get rolling without the idea so the first thing we must do is enhance ideation. Usually within industry, we are creating from our experiences being guided by our formal training and some degree of common sense. What we get may run from the pedestrian to the profound but you can generalize that we will not contrive the fundamental advance such as the transistor or the laser. To obtain the fundamental advance, the high technology breakthrough, we must create from our storehouse of basic research findings a possibly practical product or process that we can first explore and then, in various forms, enter it into the pipeline.

Most industry is no longer involved in basic research; the emphasis is in the university. Hence, our first conclusion is that the Federal government must expand support of basic research in universities. Don't make them contract research houses solving the practical problems but keep the universities at the leading edge of science and engineering. Hence, university researchers must also be tied closely into the job of education and not just do an 8-5PM job of research at a university site. Also, have a patent policy that will permit and encourage university and industry interaction.

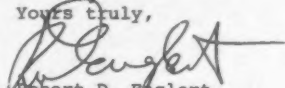
The national laboratories are other sites for basic research supplying inputs first to their general mission but secondly to the nation as a whole. I am opposed to letting such laboratories take contract money from industry to exist. I am opposed to NASA labs doing air pollution research, water pollution research, coal research, and other R&D that are not directly related to their mission. I am opposed to the new

Academy Industry program inaugurated this year by the National Academy of Sciences and the National Academy of Engineering. I'd keep industry influence away from the Academies. In general, I feel strategies should be selected that support national goals and the best tactics should be implemented within resources afforded. Tactics that veer from the missions decided on means either poor guidance or too much funding. The need for outside support means poor guidance or inadequate funding and suggests that we could do without personnel so utilized. On the other hand, consider how such government agencies and laboratories can replenish our storehouse of basic research findings. Such efforts should not detract from or compete with strong university efforts.

Such actions combined with changes in public policies as suggested by some of the references noted will, indeed, lead to enhanced innovation by industry and that to enhanced productivity in the U.S.

Thank you for this opportunity of offering some comment.

Yours truly,



Robert D. Englert
Vice President
General Manager

RDE/mp/rg

Encl.

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ENCOURAGING THE GROWTH OF INNOVATIVE, HIGH TECHNOLOGY INDUSTRY
AS A MEANS OF STRENGTHENING THE UNITED STATES ECONOMY
AND ENHANCING ITS CAPACITY TO EXPORT
IN AN INCREASINGLY COMPLEX AND COMPETITIVE WORLD MARKET:
LESSONS FROM PUERTO RICO'S RECENT EXPERIENCE

A PRESENTATION TO THE SUBCOMMITTEE ON SAVINGS,
PENSIONS AND INVESTMENT POLICY OF THE COMMITTEE ON FINANCE,
UNITED STATES SENATE

GOVERNMENT OF PUERTO RICO
ECONOMIC DEVELOPMENT ADMINISTRATION

JOSE R. MADERA
ADMINISTRATOR

DEVELOPMENT OF HIGH TECHNOLOGY INDUSTRY:
LESSONS FROM PUERTO RICO'S RECENT EXPERIENCE

I. INTRODUCTION

The U. S. Senate Subcommittee on Savings, Pensions and Investment Policy has very wisely embarked on an inquiry into the ways in which the Federal Government can assist, and avoid hindering, the growth of manufacturing and service industries that are characterized by high technology, continuing innovation, high productivity and profitability, and outstanding ability to export in an increasingly complex and competitive world market.

Puerto Rico's experience over the past five years in achieving significant growth and development of such industries, despite the manifold and powerful adverse influences at work in the world economy during most of this time, offers valuable lessons to members of Congress and Federal policy makers.

In a nutshell, in the remarkably short period of 20 years after 1950, Puerto Rico transformed itself from a depressed agricultural society to a relatively much more prosperous, but still very much "developing," industrial society in which manufacturing became the driving force for achieving economic growth and diversification and a higher standard of living for the people.

II. INDICATORS OF GROWTH AND DEVELOPMENT

Leading socioeconomic indicators of growth and development in Puerto Rico during the 20 years to 1970 include a rise in annual per capita net income from \$278 to \$3,000; an increase in average life expectancy from 60 years to 74 years; and an increase in enrollment in institutions of higher education from 12,000 to 135,000.

The vital role of the manufacturing sector in this advance is apparent from these figures:

.In 1950 the manufacturing sector accounted for net income of \$89 million, or 14.5 per cent of total net income.

.By FY 1970 the value of manufacturing net income had risen to \$958 million, or 26.1 per cent of a vastly higher total net income.

.In FY 1980 net income from manufacturing was valued at \$4.3 billion and accounted for 47.5 per cent of total net income.

.In FY 1982, despite the damaging effects of the worst recession since the Great Depression of the 30s, the manufacturing sector's contribution to net income was valued at \$5,262 million, or 51.3 per cent of total net income.

On the one hand, the strength of the sector probably boosted its share of net income abnormally. On the other hand, its strength kept the economy as a whole from even greater devastation.

In the face of so many negative forces, both in the United States and in the world as a whole, how was this dramatic growth achieved?

III. THREE KEY FACTORS

Without going into an exhaustive analysis ^{1/}, it can be said that three factors were of key importance:

1. The adoption by the Government of Puerto Rico in 1977 of an Economic Development Strategy that put its principal focus on the recruitment of private investment in high technology manufacturing and service industries.
2. The adoption by Puerto Rico of a set of Investment Incentives geared to the new Development Strategy; these incentives included partial exemption from corporate income taxes on a declining basis over specified periods of time in specified geographic regions of the Island.
3. The enactment by the U. S. Congress late in 1976 of Section 936 of the U. S. Internal Revenue Code.

Section 936 enabled subsidiaries in Puerto Rico of U. S. companies to repatriate earnings to their parents at any time substantially free of federal corporate income taxes. Repatriated earnings were subject, however, to a Puerto Rican "tollgate" tax which varied according to the length of time that earnings of Puerto Rican subsidiaries were re-invested in productive activities in the Island.

Added to Puerto Rico's own set of Investment Incentives, Section 936 gave the Island a valuable instrument in carrying on the industrial promotion effort.

^{1/} Such an analysis can be found in a presentation submitted by the P. R. Economic Development Administration to the House Committee on Banking, Finance and Urban Affairs in December, 1982.

IV. DEVELOPMENT STRATEGY

Economic development is a process, not an event. It is also a hazardous process; seldom does development proceed exactly as contemplated. Nevertheless, by setting a sense of direction and an order of priorities, a development strategy can help to make economic growth and diversification more coherent than simply leaving them to the laws of chance.

In order to frame a development strategy, the Government of Puerto Rico did its best to make a considered judgement about the probable trends in industrial development and trade that were most likely to occur around the world during the 1980's and beyond.

It then made a painstaking analysis of what should be its most promising alternatives for development, striving to identify those industries which an island society, lacking almost all the traditional natural resources for industrialization, and dependent on maritime and air transport, could reasonably endeavor to foster.

Puerto Rico took note, also, of non-traditional resources which might be developed over time through innovative technologies, such as those involving manifold conversions of solar energy to productive uses.

This exercise indicated that our best chances for the medium and long term were to be found in a universe of medium to high technology activities. Adapted to the new Schedule B for Statistical Classification of Domestic and Foreign Commodities Exported from the United States, which became

effective in January, 1978, this universe included various products under these Commodity Codes:

- 1-Animal and vegetable products, especially rum and other distilled spirits.

- 2-Textile products, especially apparel.

- 3-Chemicals, especially pharmaceuticals.

- 4-Nonmetallic minerals and products, especially diamond processing.

- 5-Metals and metal products, a classification which encompasses a vast range of machinery and equipment, including especially computers and peripherals and other high technology electronic items.

- 6-Specified products, especially footwear, scientific and professional instruments, health care products, and jewelry.

- 7-Special classifications, especially military wearing apparel and certain military equipment not of a weapons character.

V. DEVELOPMENT STRATEGY RESULTS AS SEEN IN EXPORTS TO THE UNITED STATES

The results of the new development strategy can be clearly seen in the growth of Puerto Rico's exports to the United States Mainland which has always been far and away our principal market.

In FY 1977, Puerto Rico's shipments of merchandise to the States were valued at \$3.8 billion. They included principally:

- +Chemicals valued at \$1,251 million, of which pharmaceuticals accounted for \$401.4 million.

- +Metal products valued at \$434.5 million, of which electrical products accounted for \$335 million. It is significant that computers and components were not specifically identified in Puerto Rico's detailed export statistics for FY 1977.

- +Schedule 7 products valued at \$819 million, of which apparel and related items accounted for \$507 million, and professional scientific and precision instruments for \$152 million.

In FY 1982 the Island's exports to the Mainland had a total value of \$7.4 billion, increasing by \$3.6 billion over the level of FY 1977, or by 94.7 per cent. They included principally:

- +Chemicals valued at \$2,997 million, of which pharmaceuticals and related items accounted for \$1 billion in round figures.

"Another significant category was Commodity Code 47, including petrochemicals, pigments, paints... valued at \$809.8 million."

- +Metal products valued at \$1.4 billion. Significantly, whereas exports of computer central processing units did not appear in FY 1977 summaries, they had reached a value of \$12.8 million in FY 1979, \$35.2 million in FY 1980, \$116 million in FY 1981 and \$209.2 million in FY 1982.

Over the same period, exports of computer terminals, printers, and other equipment and components increased from relatively insignificant levels to \$14 million in FY79, \$28.1 million in FY80, \$36 million in FY81, and to \$137 million in FY82.

Schedule 7 shipments valued at \$935.5 million, only a nominal increase for the entire category over FY77. However, the value of measuring, analyzing and controlling instruments and related goods had risen to \$300 million, for an increase of nearly 100 per cent in five years.

While the States constitute by far the largest purchaser of Puerto Rico's exports, the Island's direct exports to foreign countries have also been increasing, in part as a result of the growth of its high technology sector.

For example, whereas in FY77 exports to foreign countries were valued at \$459 million, or 10.2 per cent of total exports, in FY82, in the face of recessionary trends around the world, exports to foreign countries amounted to \$1,147 million, or 13 per cent of total exports, an increase in value of nearly 150 per cent in five years.

It should also be noted that many of Puerto Rico's exports to the Mainland become, in whole or in part, United States exports to foreign countries. Unfortunately, traditional accounting systems do not make it possible to show the true magnitude of Puerto Rico's contribution to U. S. exports.

VI. DEVELOPMENT STRATEGY RESULTS AS SEEN IN THE GROWTH
OF EMPLOYMENT IN HIGH TECHNOLOGY INDUSTRIES

The increasing quality of Puerto Rico's labor force is reflected in the rising share of dynamic high technology industries in total manufacturing output and employment.

At the beginning of the 70s, chemicals, electronics, machinery, petroleum products and precision instruments accounted for 22 per cent of manufacturing employment.

By mid-decade their share had risen to nearly 30 per cent and by 1981 to 40 per cent of total manufacturing employment.

Table 1 illustrates that, despite the worldwide recession and the damage done to the Island's petrochemicals industry by OPEC, overall employment in high technology enterprises has been growing by 6.6 per cent a year. The computer industry in recent years has been increasing employment by more than 20 per cent annually, while employment in the pharmaceutical sector has been growing by 10 per cent annually.

The quality of the labor force and the quality of employment in the economy as a whole have increased as result, in large part, of the development of the high technology manufacturing and service sectors. During the period 1970-76 employment in selected skilled service industries increased from a total of about 28,000 jobs to 35,000.

As Table 2 shows, employment in these industries increased at a faster rate in 1977-81, so that at the end of the period there had been a gain of more than 13,000 jobs, or a rate of growth for these sectors overall of close to 8 per cent annually.

TABLE 1

LEVEL OF EMPLOYMENT AS OF OCTOBER, 1981
AND ANNUAL COMPOUND RATE OF GROWTH, 1976-81
FOR SELECTED HIGH TECHNOLOGY INDUSTRIES IN PUERTO RICO

<u>INDUSTRY</u>	<u>NUMBER OF EMPLOYEES</u>	<u>ANNUAL COMPOUND RATE OF GROWTH 1976-81</u>
CHEMICALS & RELATED PRODUCTS	15,800	4.8
Pharmaceuticals	(11,750)	9.9
Health Products	(1,450)	5.2
PETROLEUM REFINING	2,600	-2.2
MACHINERY EXCEPT ELECTRICAL	8,900	15.6
Computers	(6,800)	20.3
ELECTRICAL MACHINERY AND EQUIPMENT	19,770	8.2
SCIENTIFIC AND PRECISION INSTRUMENTS	13,100	4.3
TOTAL, HIGH TECHNOLOGY MANUFACTURING	60,200	6.6
TOTAL, ALL MANUFACTURING	151,600	0.9

Source, P. R. Department of Labor and Human Resources

TABLE 2

EMPLOYMENT IN SELECTED SKILLED SERVICE INDUSTRIES
IN PUERTO RICO 1977-81
(FIGURES ROUNDED)

<u>FIELD OF EMPLOYMENT</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
SIC 60: Finance, Insurance, Real Estate	19,000	19,000	21,000	23,000	25,000
SIC 73: Business Services	15,200	16,800	17,500	18,900	21,700
SIC 81: Legal Services	2,000	2,200	2,250	2,200	2,900
TOTAL	36,200	38,000	40,750	44,100	49,600

Souce: Business and Legal Services: P.R. Department of Labor
Finance, Insurance and Real Estate: P.R. Planning Board

Puerto Ricans are increasingly filling managerial and technical positions in both the manufacturing and service sectors. Today, out of every 100 managerial and technical posts, more than 93 are held by Puerto Ricans, a gratifying sign of our people's aspirations and capabilities in the realm of high technology.

Indeed, the growth of high technology manufacturing and export service industries since enactment of Section 936 has provided powerful direct and indirect stimuli to accounting, advertising, computer programming and data processing, engineering and architectural and management consulting, marketing and other fields as well as finance and insurance, legal and other business services.

The fact that almost all Puerto Ricans serving in these skilled service industries are bilingual gives Puerto Rico added strength for an expanding role as a Latin American/Caribbean center for high technology manufacturing and services for export.

Furthermore, the infrastructure developed to supply Puerto Rico's manufacturing sector provides spillover benefits to the economy and society at large. The extensive network of highways, electric power, telecommunications, airlines, water supply and waste treatment systems has been made possible by economies of scale and by profit and payroll taxes generated directly and indirectly through spending multipliers of high technology firms, the vast majority of which are Section 936 enterprises. For example, overseas toll revenues of the P. R. Telephone Company increased by 240 per cent between 1976 and 1981, although overseas toll rates dropped substantially as a result of Puerto Rico's integration into the U. S. long distance system by the Federal Communications Commission. In 1981, overseas toll revenues constituted 45.4 percent of total operating revenues of the Telephone Company.

VII. DEVELOPMENT STRATEGY RESULTS AS SEEN IN THE QUALITY OF HIGH TECHNOLOGY INVESTMENT RECRUITED

Under the best circumstances, five years is not an adequate period for judging the effectiveness of a development strategy based on the recruitment of high technology industries. This presentation evaluates a strategy that has been applied in far from ideal conditions. Perhaps this is "acid testimony" to the soundness of the strategy.

Puerto Rico's experience shows that in such areas as computers and electronics, new firms start as relatively small operations, build slowly over the first two or three years, and then expand fairly rapidly.

In certain pharmaceutical operations, on the other hand, there is a critical size which may require three, four or five years from the decision to launch a venture until it reaches the stage of full scale production.

In general, however, high technology operations are characterized by high quality from the outset, continuing innovation, high investment in research and development, and the capacity to export. All of these characteristics are found in Puerto Rico's universe of high technology industry.

The U. S. Department of Commerce Industrial Outlook for 1983 shows that, over the past few years, the basic fields of electronics (including the information and telecommunications sectors) pharmaceuticals and health care products have had outstanding records in terms of growth of sales, level of profits, level of investment in R&D and level of retained earnings as a per cent of income. These industries are also considered to be among those that will be top performers in the years ahead.

It is worth taking special note of the fact that drug and electronic industries as a whole, while having profits exceeding 10 per cent annually, have also had exceptionally high investment and exceptionally high retained earnings as a per cent of income.

In the case of pharmaceuticals, while profits overall have averaged about 12.5 per cent annually, R&D expenditures as a per cent of income have exceeded 50 per cent and retained earnings have been almost as high. Higher profits, in other words, have not translated into high dividend payouts; rather, they have translated into new investment for the future.

In the case of electronics, profits overall have been slightly higher than for the drug industry, while investment in R&D has exceeded total income and retained earnings have averaged close to 80 per cent of net income.

The editors of FORTUNE magazine recently published the results of a survey in which 6,000 executives, outside directors and financial analysts were asked to rate the 10 largest companies in the 20 largest industries of the United States on the basis of eight measures of excellence: quality of management; quality of products or services; innovativeness; financial soundness; ability to attract, develop and keep talented people; community and environmental responsibility; and effective use of corporate assets. (FORTUNE, Jan. 10, 1983).

The companies with the highest rankings of all, in order from first to 10th, were: IBM, Hewlett-Packard, Johnson & Johnson, Eastman Kodak, Merck, AT&T, Digital Equipment, SmithKline Beckman, General Electric and General Mills.

Of these 10 top leaders, Hewlett-Packard, Johnson & Johnson, Merck, Digital Equipment, SmithKline Beckman and General Electric are major manufacturers in Puerto Rico, and General Mills a smaller manufacturer, while IBM has a major presence as a supplier of equipment and services; AT&T has provided important consulting services to the P. R. Telephone Company; and Eastman Kodak maintains a Caribbean regional distribution center for its full line of photographic, audiovisual and microfilm products.

General Electric set up its first plant in Puerto Rico in 1956 to manufacture circuit breakers. It now has a score of operations which include plants producing under SICs 35, 36 and 38 with a total of more than 3,200 employees.

Digital, which established its first plant in 1968 with a work force of fewer than 200 persons, now employs 3,000.

Hewlett-Packard, which began operations in 1980 with a labor force of 27 making computer video terminals, now employs close to 300 persons.

All in all, Puerto Rico's present high technology manufacturing universe includes names which, if not in the top 10 of FORTUNE's list, would have to be high on any list for quality of product, innovational strength and capacity to export.

In SIC 28 they go from Abbott Pharmaceutical through the alphabet to Winthrop; in SIC 35 from American Tool & Die, ^{Abie} ~~Abie~~ Computer and Applied Magnetics to Wang and Westinghouse; in SIC 36 from Atari to Union Carbide; and in SIC 38 from Allen Group to Weston.

VIII. DEVELOPMENT STRATEGY RESULTS AS SEEN IN THE GROWTH
OF PUERTO RICO AS A MARKET FOR THE UNITED STATES

Since the beginning of its modern economic development effort in the early 1950's Puerto Rico has been an increasingly important market for the United States. In terms of dollar value in the past decade or so, this relatively small island's purchases of U.S. goods have made it rank fifth, sixth or seventh among all U.S. major trading partners. In per capita terms it is far and away the best customer of the United States in the world.

Reflecting the growth of the economy, Puerto Rico's purchases from the States in 1970 were valued at \$1,964 million. With a population at that time of 2,710,000, the Island bought \$725 worth of U.S. goods per capita.

In the 12 months ended October 31, 1982, a period of deep recession, Puerto Rico's imports from the 50 States had a total value of \$5.3 billion. With the Island's population estimated at 3,300,000, this meant that per capita purchases had risen to \$1,600.

While the composition of Puerto Rico's purchases has changed, with inputs for manufacturing rising sharply and the percentage of consumer goods edging downward, its imports have created steadily increasing employment in the United States.

A study done for Fomento by Economic Associates, Inc. of Washington, D.C., on Puerto Rico's purchases from the U.S. in FY 1980, which were valued at \$5.1 billion, showed that they generated employment for 153,000 mainland citizens.

It is also important to note that Puerto Rico, while increasing its imports from the States, has also been increasing its purchases from foreign countries. The value of imports from foreign countries increased from \$568 million in 1970 to an all time record value of \$5.7 billion in 1981, a ten-fold increase. While the largest single component of these imports in recent years has been OPEC oil, imports of automobiles from Japan have been steadily and sharply eroding the once dominant U.S. share. Japan is also an increasingly important supplier of electronics equipment and other high technology items.

Puerto Rico's devastatingly high oil import bill has been compensated for, in part, by imports of more fuel-efficient Japanese motor vehicles. For numerous reasons, pride in United States citizenship being one of the most important, Puerto Rico would have preferred fuel efficiency of American origin. It is instructive to note that, long before the Japanese emerged as the tigers of the automotive world, and long before the OPEC sledge hammers began to fall, Volkswagen of West Germany captured a major share of the Puerto Rican auto market sheerly as a matter of economics.

IX. CONCLUSION

Tax incentives have been and will continue to be important in helping Puerto Rico to carry forward its strategy for economic growth and diversification as a means of improving the quality of life of its 3.3 million American citizens.

Section 936 has proved to be a vital element in this effort in a relatively short period of time. Section 936 as amended by TEFRA in August, 1982 needs to be given a chance to work, without further amendment or threat of amendment, for a reasonable span of years.

The Government of Puerto Rico and the private sector have embarked on a continuing program to more effectively measure the benefits of 936 to the Island and to the Nation.

In the final analysis, however, productivity will turn out to be the decisive factor in our development strategy. Unless an industry is competitive in the world market, no amount of tax incentives can make it viable because it will have no earnings, or insufficient earnings, to attract stockholders and to plow capital back into continuing innovation.

Therefore, Puerto Rico has developed as a supplement to its incentives, an extensive program for worker and managerial training to which both government and the private sector contribute. Upgrading the work force and the managerial echelons will continue to be essential in the future because development, being a process rather than an event, is never "complete."

This is a conclusion that applies not only to Puerto Rico, but to both "sunset" and "sunrise" industries in the United States, and even to Japan. That nation, to the surprise of some, is not immune to competition.

It is now in the process of deciding whether to continue the program set up in 1978 for helping depressed industries such as aluminum, fertilizers, petrochemicals, steel and textiles, which have been losing their competitive edge for various reasons, including the high cost of energy, low wage competition from other producing areas, or the rise of new basic industries in developing countries.

Recognizing that economic development is a process, not an event, and that it is never "complete," Puerto Rico is seeking not only to become a major center of high technology manufacturing but to move to the third stage of development which means becoming a creator of new products and technology. Our progress in mastering high technology in manufacturing and services gives us encouragement to stimulate in our Island commercially valuable research and development activities.

The University of Puerto Rico's Center for Energy and Environment Research has demonstrated, in one of the outstanding programs funded by the U.S. Department of Energy, that it should be possible for the sugarcane growing areas of the tropics to transform declining industries based on sugarcane as a supplier of sucrose into vital and profitable industries producing sugarcane as a source of fuel and even more valuable chemical feedstocks.

It has become a practice in some of Puerto Rico's high technology companies to send promising scientific and engineering personnel to their mainland research and development headquarters.

We propose to build on these advances by offering special incentives to private investors for the establishment of R&D operations in the Island.

Just as this presentation was being finished, Governor Romero sent to the Legislative Assembly companion measures (House Bill No. 785 and Senate Bill No. 788) that would give special incentives for investment in research facilities engaged in creating new sources of energy, new technologies for energy conservation or processes for increasing energy efficiency, new industrial products and processes, and improved products and processes.

The measures and the incentives they propose to offer have been under consideration for some time. As it happens, the philosophy behind them is in harmony with the TEFRA amendments to the 936 program which give parent companies an incentive for carrying on R&D in Puerto Rico rather than in foreign locations.

We have these final suggestions for the Subcommittee in carrying its inquiry on high technology to a successful conclusion:

1. Visit some of Puerto Rico's most successful operations and then visit the parent company headquarters to gain an insight into what accounts for their success and how they benefit the nation as a whole.

2. Consider how the application of high technology might help depressed basic industries such as those for which the American financier, Felix Rohatyn, has proposed the establishment of a new kind of Reconstruction Finance Corporation.

3. Consider how the new Export Trading Company Act, in combination with tax or other incentives to export, can help small, innovative, high technology companies to grow and improve America's competitive position in the world.

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IN REPLY REFER TO:

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United States Senate
Committee on Finance
Subcommittee on Savings,
Pensions, and Investment Policy
Room 2227
Dirksen Senate Office Building
Washington, D.C. 20510

Re: Hearings to Promote High-Growth Industries

Dear Senator Chafee:

One of the simplest, most effective methods to encourage the emergence of high-growth industries based on new technologies would be to amend the Tax Code so as to encourage R&D limited partnership tax shelters which provide the investors a multiple write-off. As you know, to attain a multiple write-off under present law is extremely difficult and constitutes very "aggressive" tax planning. Thus, potential investors must face a double risk at present: whether the research will be successful and whether the IRS will attack the write-off.

If the objective is to create high-technology industries in the United States via government assistance, then there should be explicit recognition of the fact that the assistance can come either through direct government grants and subsidies or through private investors. Private investors, however, are reluctant to invest in high-technology projects which require research and development unless their risk is underwritten by the government.

FRESHMAN, MULVANEY, MARANTZ,
COMSKY, KAHAN & DEUTSCH

A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS

Senator John H. Chafee
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Page Two

A one-for-one write-off does not satisfy the private investor because at most an investor in the 50% bracket will be able to realize tax savings of only half of his investment. In order to bring out the reluctant investors, it is necessary to provide them with at least a multiple write-off so that if the R&D is unsuccessful, all of the investment can be written off.

In assessing the incentive that an R&D tax shelter provides to a potential investor contemplating a decision over whether to invest in a particular R&D project, the distinction must be made between an R&D project sponsored by an established company seeking to develop a new product line and an R&D project sponsored by a start-up company seeking to go into business.

Because of the reduced risk involved in an R&D project sponsored by an established company, the investor contemplating such an investment needs a much lower incentive and thus a one-for-one write-off would be a sufficient incentive. However, the investor contemplating whether to make an investment in an R&D project sponsored by a start-up company faces a much greater risk. For such an investor an R&D limited partnership financing is a form of venture capital financing which the average investor is unwilling to make.

Accordingly, in approaching public policy analysis of the question of whether it would be in the best interests of the country to permit multiple write-off tax shelters for R&D projects, I would suggest that this distinction be made. If the project is being sponsored by an established company, no special effort should be made in tax legislation to permit multiple write-offs. However, in the case of a start-up company wishing to embark on an R&D program to develop a new technology, national policy should encourage tax sheltered venture capital investments by means of multiple write-offs.

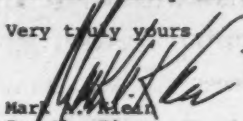
This incentive is especially important in view of the reduction in marginal tax rates which will take effect in 1983. Moreover, because many competing tax shelter investments offer a four-to-one write-off, it may be necessary to provide the same incentive for investors in R&D tax shelters as are provided to investors in oil and gas and in cattle tax shelters. After all the country has an oil glut and there is no dearth of cattle.

FRESHMAN, MULVANEY, MARANTZ,
COMSKY, KAHAN & DEUTSCH
A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS

Senator John H. Chafee
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Page Three

While it is true that there has been a significant amount of R&D limited partnership funding raised in one-for-one write-off offerings, the number of investment banking firms, underwriting firms, and others participating in this effort is miniscule compared to the potential demand for such funding by emerging high growth companies. Clearly, in order to satisfy this demand, it will be necessary to induce the vast number of fence sitting investors to provide the capital necessary to foster a large number of high growth technologies. While it is obvious that allowing high bracket investors multiple write-offs will reduce initially funds going to the U.S. Treasury, in the long run the treasury will be benefited because the industries which will be created from the R&D financing provided by private investors will broaden the tax base of the country and create jobs.

Very truly yours


Mark W. Kahan
For the Firm

MAK:eb

cc: Mr. Robert E. Lightihizer, Chief Counsel



U.S. Small Business Administration

Washington, DC

20416

STATEMENT OF
JAMES C. SANDERS, ADMINISTRATOR
SMALL BUSINESS ADMINISTRATION
BEFORE THE
SUBCOMMITTEE ON SAVINGS, PENSIONS AND INVESTMENT POLICY
COMMITTEE ON FINANCE
UNITED STATES SENATE

JANUARY 19, 1983

MR. CHAIRMAN AND MEMBERS OF THIS SUBCOMMITTEE:

THE SMALL BUSINESS ADMINISTRATION APPRECIATES THE OPPORTUNITY TO PRESENT TO THIS SUBCOMMITTEE OUR VIEWS ON GOVERNMENT POLICIES TO PROMOTE HIGH-GROWTH, NEW TECHNOLOGY BASED INDUSTRIES AND TO INCREASE U.S. COMPETITIVENESS. THE CENTRAL MESSAGE THAT I WISH TO BRING TO YOU IS THAT ANY SUCH POLICIES SHOULD BE DESIGNED WITH FULL KNOWLEDGE OF THE CENTRAL IMPORTANCE OF SMALL HIGH TECHNOLOGY-BASED FIRMS.

THE CHALLENGE FROM ABROAD

MR. CHAIRMAN, THE AMERICAN ECONOMY FACES A SERIOUS CHALLENGE FROM ABROAD. PRODUCTIVITY GROWTH HAS FALLEN AND LAGS BEHIND LEVELS ACHIEVED IN EUROPE AND JAPAN. WE FACE A GROWING CHALLENGE TO OUR ONCE DOMINANT POSITION IN

TECHNOLOGICAL INNOVATION FROM JAPAN, FROM GERMANY AND FROM OTHER COUNTRIES ALL OVER THE WORLD. ACCORDING TO A HARVARD BUSINESS SCHOOL PROFESSOR QUOTED RECENTLY IN A WASHINGTON POST SERIES ON THE DECLINE OF AMERICAN LEADERSHIP IN INNOVATION, "BY THEIR PREFERENCE FOR SERVING EXISTING MARKETS RATHER THAN CREATING NEW ONES AND BY THEIR DEVOTION TO SHORT-TERM RETURNS AND 'MANAGEMENT BY THE NUMBERS,' MANY (AMERICAN BUSINESS MANAGERS) HAVE EFFECTIVELY FORSWORN LONG-TERM TECHNOLOGICAL SUPERIORITY AS A COMPETITIVE WEAPON." THIS CRITICISM HAS BECOME WIDELY ACCEPTED IN THE BUSINESS COMMUNITY. OF NEARLY 1,000 CHIEF EXECUTIVES RECENTLY SURVEYED, 76 PERCENT AGREED THAT THERE HAS BEEN A DAMAGING OVER-EMPHASIS ON SHORT TERM PROFITS.

THE IMPORTANCE OF INNOVATION IN ECONOMIC GROWTH

ECONOMISTS AGREE THAT INNOVATION IS A VERY IMPORTANT SOURCE OF ECONOMIC GROWTH. A LEADING STUDENT OF THE SUBJECT, JOHN KENDRICK, GOES SO FAR AS TO SAY THAT "IN MODERN ECONOMIES THE MOST IMPORTANT FORCE BEHIND PRODUCTIVITY GROWTH IS TECHNOLOGICAL PROGRESS..."(1) A REPORT BY THE JOINT ECONOMIC COMMITTEE CONCLUDED THAT HIGH TECHNOLOGY INDUSTRIES ACCOUNTED FOR 75 PERCENT OF THE NET

INCREASE IN MANUFACTURING JOBS FROM 1955 TO 1979.
TRADITIONAL MANUFACTURING INDUSTRIES ARE NOT CREATING MANY
NEW JOBS.(2)

THE IMPORTANCE OF SMALL BUSINESS IN INNOVATION

WHAT IS THE SOURCE OF INNOVATIONS? ACCORDING TO A STUDY
CONDUCTED FOR THE SMALL BUSINESS ADMINISTRATION, SMALL
BUSINESS'S ROLE IS INDEED IMPRESSIVE. SMALL AMERICAN
FIRMS PRODUCE 2.5 TIMES AS MANY INNOVATIONS PER EMPLOYEE
AS DO LARGE FIRMS. SMALL FIRMS ALSO BRING THEIR
INNOVATIONS TO MARKET FASTER THAN DO LARGE FIRMS. BUT
LARGE FIRMS ARE 2.8 TIMES MORE LIKELY TO BE ASSISTED IN
INNOVATION BY PUBLIC FUNDS.(3)

ACCORDING TO ANOTHER GOVERNMENT STUDY, SMALL FIRMS
ACCOUNTED FOR ALMOST HALF OF MAJOR U.S. INNOVATIONS
BETWEEN 1953 AND 1973. THE RATIO OF INNOVATIONS TO SALES
IS ABOUT ONE-THIRD GREATER IN SMALL FIRMS. THE COST PER
R&D SCIENTIST IN SMALL FIRMS IS ONLY HALF THAT FOUND IN
LARGE FIRMS.(4)

OTHER REPORTS CONTAIN SIMILAR FINDINGS:

O OF 61 IMPORTANT INVENTIONS AND INNOVATIONS OF THE TWENTIETH CENTURY, OVER HALF CAME FROM INDEPENDENT INVENTORS OR SMALL FIRMS.(5) OF 149 INVENTIONS IN THE ALUMINUM INDUSTRY, MAJOR PRODUCERS ACCOUNTED FOR ONLY ONE IN SEVEN.(6) OF 13 MAJOR INNOVATIONS IN THE AMERICAN STEEL INDUSTRY, FOUR CAME FROM EUROPEAN COMPANIES, SEVEN FROM INDEPENDENT INVENTORS AND NONE CAME FROM AMERICAN STEEL COMPANIES.(7) OF SEVEN MAJOR INVENTIONS IN THE REFINING AND CRACKING OF PETROLEUM, ALL WERE MADE BY INDEPENDENT INVENTORS.(8)

THESE ARE NOT TRIVIAL INNOVATIONS WE ARE TALKING ABOUT, MR. CHAIRMAN. TWENTIETH CENTURY INVENTIONS AND/OR INNOVATIONS BY AMERICAN SMALL BUSINESSES INCLUDE AIR CONDITIONING, THE AIRPLANE, THE ASSEMBLY LINE, THE CAT SCANNER, CATALYTIC PETROLEUM CRACKING, THE GYROCOMPASS, THE HEART VALVE, THE HELICOPTER, THE HIGH CAPACITY COMPUTER, THE LINK TRAINER, THE OPTICAL SCANNER, POLAROID PHOTOGRAPHY, AND XEROGRAPHY. I ASK UNANIMOUS CONSENT TO HAVE INSERTED AT THE CONCLUSION OF MY REMARKS A LIST OF SOME IMPORTANT INNOVATIONS BY UNITED STATES SMALL BUSINESSES.

THE POINT IS UNMISTAKABLE. SIGNIFICANT INNOVATIONS ARE MORE LIKELY TO COME FROM SMALL BUSINESS AND INDEPENDENT INVENTORS THAN FROM THE LARGE, INSTITUTIONALIZED RESEARCH LABORATORY. THE REASONS ARE MANY. IN THE SMALL BUSINESS THERE CAN BE A MORE CREATIVE ENVIRONMENT. RULES ARE LESS FORMAL. THERE IS NO LARGE BUREAUCRACY TO CONTEND WITH. THE BOSS IS TYPICALLY THE PERSON WITH THE DRIVE TO BE INNOVATIVE. FREQUENTLY THE HEADS OF SUCH SMALL INNOVATIVE FIRMS HAVE LEFT UNIVERSITIES OR LARGE CORPORATIONS IN ORDER TO STRIKE OUT ON THEIR OWN AND RUN THEIR OWN ENTERPRISES. INCENTIVES ARE GREATER: THERE IS A SENSE OF CREATING AN ORGANIZATION AND PERSONAL INVOLVEMENT WITH THE INNOVATION. PEOPLE WORK LONGER AND HARDER. THERE IS NOT THE INTENSE PRESSURE FOR SHORT-LIVED INVESTMENTS WITH QUICK CASH PAYOFFS THAT IS FOUND IN BIG BUSINESS. INDEED, THE WHOLE PURPOSE OF INNOVATIVE SMALL FIRMS IS TO MAKE AND MARKET THE TECHNOLOGICAL BREAKTHROUGHS THAT WILL ENABLE THEM TO BECOME LARGE FIRMS.

BASED UPON THE FOREGOING EVIDENCE, MR. CHAIRMAN, I HOPE THAT WE CAN DISPEL TWO WIDESPREAD BUT UNTRUE STEREOTYPES. THE FIRST IS THAT NEARLY ALL NEW INVENTIVE CONCEPTS COME FROM THE RESEARCH LABS OF LARGE UNIVERSITIES OR LARGE CORPORATIONS. THE SECOND IS THAT THE SMALL BUSINESS FIRMS

WE ARE TALKING ABOUT ARE SIMPLY THE RESEARCH EQUIVALENT OF A MOM AND POP GROCERY STORE. PRESIDENT REAGAN SUMMED IT UP WELL IN HIS REMARKS LAST YEAR WHEN HE SAID THAT "SMALL BUSINESS CONTINUES TO BE OUR MOST PROLIFIC SOURCE OF INNOVATION."

THE FEDERAL GOVERNMENT'S ATTITUDE TOWARD SMALL HIGH TECHNOLOGY FIRMS

IN THE FACE OF DECLINING AMERICAN TECHNOLOGICAL SUPERIORITY AND THE DOCUMENTED ROLE OF HIGH TECHNOLOGY SMALL BUSINESS, WHAT HAS BEEN THE FEDERAL GOVERNMENT'S ATTITUDE TOWARD SUPPORTING SMALL BUSINESS' EFFORTS AT TECHNOLOGICAL INNOVATION? WELL, BACK IN 1904 THE FEDERAL GOVERNMENT DECLINED A SMALL BUSINESS' OFFER TO DEVELOP AN INNOVATION FOR GOVERNMENTAL USE. BEFORE THE GOVERNMENT WOULD SPEND A DIME, THE "DEVICE MUST HAVE BEEN BROUGHT TO THE STAGE OF PRACTICAL OPERATION WITHOUT EXPENSE TO THE U.S. GOVERNMENT." IN OTHER WORDS, NO R&D FOR SMALL BUSINESS. MR. CHAIRMAN, THE SMALL BUSINESS IN THIS EXAMPLE WAS OWNED BY WILBUR AND ORVILLE WRIGHT, AND THEIR INNOVATION WAS THE AIRPLANE.

WITHOUT EXAGGERATION ONE CAN SAFELY SAY THAT THE FEDERAL GOVERNMENT'S ATTITUDE HAS NOT CHANGED MUCH IN THE PAST 80

YEARS. IN A MAJOR STUDY ON INVENTION IN THE INDUSTRIAL RESEARCH LABORATORY, DANIEL HAMBERG CONCLUDES THAT "WITHOUT ANY CAREFUL CONSIDERATION, THE LABORATORIES OF THE LARGE INDUSTRIAL CORPORATIONS HAVE BEEN RECEIVING ALL THE ACCOLADES AND MOST OF THE SUPPORT. ALTHOUGH IT APPEARS THAT THE BULK OF MAJOR INVENTIONS ORIGINATE OUTSIDE THESE LABORATORIES, PARTICULARLY IN THE WORK OF INDEPENDENT INVENTORS AND SMALL-AND MEDIUM-SIZE FIRMS, THESE SOURCES HAVE BEEN RELATIVELY NEGLECTED AND THEIR POTENTIAL CONTRIBUTIONS VIRTUALLY IGNORED--AT LEAST IN OUR FORMAL POLICIES. IT SEEMS CLEAR THAT FUTURE EFFORTS TO FOSTER TECHNOLOGICAL PROCESS MUST CEASE THIS NEGLECT AND DEVELOP WAYS OF SUPPORTING THESE WELLSPRINGS OF FUNDAMENTAL ADVANCES IN THE ARTS."(9)

AS THE ATTACHED TABLE SHOWS, SMALL BUSINESS' PERCENTAGE OF FEDERAL R&D HAS DECLINED OVER THE PAST 25 YEARS.

THE REASONS FOR SMALL BUSINESSES' LOW PARTICIPATION ARE MANY. COMPLEX REGULATIONS PLACE A PREMIUM ON LAWYERS, ACCOUNTANTS, AND PROCUREMENT SPECIALISTS - LUXURIES A SMALL BUSINESS CANNOT AFFORD. WE ARE AWARE OF MANY SMALL BUSINESS OPERATORS WHO NEVER BOTHER TO TRY BECAUSE OF THE PAPERWORK AND REGULATORY BARRIERS. ADDITIONALLY, IN MANY

PERCENTAGE OF FEDERAL R&D FUNDS TO FIRMS WITH
LESS THAN 1,000 EMPLOYEES

1957 to 1980

Year	<u>1957</u>	<u>1958</u>	<u>1963</u>	<u>1967</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Percentage	3.8	4.9	2.6	2.7	4.7	4.1	3.2	3.8	4.5	3.2	3.1	2.0	1.9	3.1	2.6

Source: National Science Foundation

INSTANCES SMALL R&D FIRMS REFUSE TO COMPETE WITH LARGE INDUSTRY AND NONPROFIT INSTITUTIONS. FRANKLY, COMPLEX REGULATIONS ALSO SERVE AS A DISINCENTIVE FOR AGENCY OFFICIALS. DEALING WITH SMALL FIRMS REQUIRES MORE PATIENCE AND GUIDANCE. IT IS SIMPLY EASIER TO WORK WITH THE LARGE FIRMS. AND A BIAS IN FAVOR OF LARGE FIRMS CAN EXIST WHEN AWARDING R&D CONTRACTS. THERE IS A TENDENCY ON THE PART OF CONTRACTING OFFICIALS TO CONSIDER AWARDS TO LARGE WELL-ESTABLISHED FIRMS "SAFER" THAN TO SMALL FIRMS.

WE HAVE MADE SUBSTANTIAL PROGRESS TOWARD ELIMINATING THE OBSTACLES STANDING IN THE WAY OF INNOVATION. THE 96TH CONGRESS REMOVED SOME OF THOSE BARRIERS. PUBLIC LAW 96-517 WAS THE FIRST PATENT SYSTEM REFORM IN MANY YEARS. AMONG THE REFORMS WERE IMPROVEMENTS IN SMALL BUSINESSES' ABILITY TO RETAIN TITLE TO PATENTS DEVELOPED WITH FEDERAL FUNDS.

PUBLIC LAW 96-477, THE SMALL BUSINESS INVESTMENT INCENTIVES ACT, SHOULD IMPROVE THE OPPORTUNITIES FOR SMALL BUSINESSES IN THE HIGH TECHNOLOGY FIELD TO RAISE CAPITAL. PUBLIC LAW 96-354, THE REGULATORY FLEXIBILITY ACT; PUBLIC LAW 96-481, EQUAL ACCESS TO JUSTICE; AND PUBLIC LAW 96-511, THE PAPERWORK REDUCTION ACT, SHOULD ALL HELP

REDUCE THE REGULATORY BURDEN IMPOSED ON SMALL COMPANIES BY THE GOVERNMENT. FINALLY, THE ECONOMIC RECOVERY TAX ACT OF 1981 (PUBLIC LAW 97-34) PROVIDES AN INCENTIVE TO BUSINESSES TO INCREASE THEIR OWN R&D EXPENDITURES.

THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT

WHAT REMAINS IS IMPROVING SMALL BUSINESSES' ACCESS TO FEDERAL R&D BUDGETS, WHICH BRINGS US UP TO THE MOST RECENT LEGISLATION PASSED BY CONGRESS. ON JULY 22, 1982 PRESIDENT REAGAN SIGNED INTO LAW PUBLIC LAW 97-219, THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT.

THIS STATUTE STRENGTHENS THE ROLE OF SMALL, INNOVATIVE FIRMS IN FEDERALLY-FUNDED RESEARCH AND DEVELOPMENT. IT CREATES A NATIONAL POLICY FOR GREATER UTILIZATION OF FEDERAL RESEARCH AND DEVELOPMENT AS A BASE FOR TECHNOLOGICAL INNOVATION WHILE AT THE SAME TIME MEETING PARTICULAR AGENCY NEEDS.

FEDERAL AGENCIES WHICH HAVE AN EXTERNAL RESEARCH AND DEVELOPMENT BUDGET OF MORE THAN \$100 MILLION ARE REQUIRED TO ESTABLISH SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAMS. THROUGH THESE PROGRAMS A PERCENTAGE OF THE R&D BUDGET WILL BE SET-ASIDE FOR FUNDING AGREEMENTS WITH SMALL BUSINESS. SMALL BUSINESSES WILL COMPETE AMONG THEMSELVES FOR AWARDS UNDER THESE PROGRAMS.

TEN AGENCIES ARE INVOLVED: DEFENSE, NASA, HEALTH AND HUMAN SERVICES, ENERGY, TRANSPORTATION, NATIONAL SCIENCE FOUNDATION, AGRICULTURE, ENVIRONMENTAL PROTECTION AGENCY, NUCLEAR REGULATORY COMMISSION AND INTERIOR.

FUNDING FOR THE SBIR PROGRAM IN CIVILIAN AGENCIES WILL BE PHASED IN OVER A FOUR-YEAR PERIOD AND OVER A FIVE-YEAR PERIOD FOR THE DEPARTMENT OF DEFENSE. PERCENTAGES AND THE APPROXIMATE DOLLARS OF AGENCY OUTSIDE RESEARCH AND DEVELOPMENT BUDGET WHICH WILL BE APPLIED ARE ESTIMATED AS FOLLOWS:

<u>FISCAL YEAR</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
CIVILIAN AGENCIES	.2	.6	1.0	1.25	1.25
DOD	.1	.3	.5	1.00	1.25
MILLIONS OF DOLLARS	40-45	130-135	240-250	400-425	450-500

THE ACT IS INTENDED TO ENCOURAGE PARTICIPATION OF SMALL SCIENCE AND HIGH-TECHNOLOGY FIRMS IN GOVERNMENT RESEARCH AND ALSO PROVIDES INCENTIVES FOR THE CONVERSION OF RESEARCH RESULTS INTO TECHNOLOGICAL INNOVATION AND COMMERCIAL APPLICATIONS. FOLLOW-ON PRIVATE FUNDING FROM VENTURE CAPITAL AND INDUSTRIAL FIRMS WILL HELP PURSUE POTENTIAL COMMERCIAL APPLICATIONS OF GOVERNMENT R&D.

IN ADDITION TO ESTABLISHING SBIR PROGRAMS, THE ACT ALSO REQUIRES FEDERAL AGENCIES WITH RESEARCH OR RESEARCH AND

DEVELOPMENT BUDGETS IN EXCESS OF \$20 MILLION TO ESTABLISH GOALS FOR SMALL BUSINESS R&D FUNDING WHICH SHALL NOT BE LESS THAN THE AMOUNT SPENT WITH SMALL BUSINESS IN THE PRECEDING FISCAL YEAR. THIS WILL INCLUDE APPROXIMATELY 17 ADDITIONAL AGENCIES.

UNDER THE ACT, THE SMALL BUSINESS ADMINISTRATION IS REQUIRED TO ISSUE POLICY DIRECTIVES GOVERNING THE GENERAL OPERATION OF SBIR PROGRAMS. THESE DIRECTIVES WERE ISSUED ON NOVEMBER 24, 1982. AN IMPORTANT PART OF THIS PROCESS WILL BE TO PROVIDE A SIMPLIFIED AND STANDARDIZED FORMAT FOR SMALL BUSINESS TO USE IN SOLICITING FEDERAL R&D WORK.

THE ACT IS BASED UPON THE HIGHLY SUCCESSFUL SMALL BUSINESS INNOVATION RESEARCH PROGRAM INITIATED BY THE NATIONAL SCIENCE FOUNDATION IN 1977. TO DATE NSF HAS RECEIVED OVER 3,000 PROPOSALS FROM SMALL FIRMS AND OVER 400 PROJECTS HAVE BEEN FUNDED. FEDERAL FUNDING HAS TOTALED ABOUT \$20 MILLION. PRIVATE FOLLOW-ON FUNDING FROM THEIR \$5 MILLION FIRST YEAR PROGRAM NOW EXCEEDS \$41 MILLION DUE DIRECTLY OR IN PART TO THE SBIR PROGRAM. THIS IS APPROXIMATELY EIGHT TIMES THE AMOUNT OF RESEARCH EXPENDITURES BY NSF FOR THESE AWARDS. OF THOSE FIRMS THAT HAVE COMPLETED PHASES I AND II, EMPLOYMENT HAS INCREASED 125 PERCENT SINCE 1977, ALTHOUGH NOT NECESSARILY DUE TO NSF SUPPORT.

TO MEET ITS AUTHORITY AND RESPONSIBILITY UNDER THE LAW THE SBA IMMEDIATELY ESTABLISHED A TASK FORCE, DIRECTLY REPORTING TO THE ADMINISTRATOR, TO ENSURE THAT THE LAW IS RAPIDLY AND COMPLETELY IMPLEMENTED. SUBSEQUENTLY, A PERMANENT OFFICE OF INNOVATION, RESEARCH AND TECHNOLOGY WAS ESTABLISHED TO ADMINISTER THE PROGRAM.

IN ORDER TO ACCOMPLISH THE DEVELOPMENT, COORDINATION AND ISSUANCE OF THE POLICY DIRECTIVES IN A TIMELY FASHION, OUR OFFICE OF INNOVATION, RESEARCH AND TECHNOLOGY HAS TAKEN THE FOLLOWING ACTIONS:

- O ESTABLISHED AN ON-GOING AD HOC WORKING GROUP TO DEVELOP THE POLICY DIRECTIVES. THE GROUP CONSISTS OF REPRESENTATIVES FROM VARIOUS OFFICES WITHIN SBA AND THE NATIONAL SCIENCE FOUNDATION.
- O CONDUCTED MEETINGS WITH THE HOUSE AND SENATE SMALL BUSINESS COMMITTEES, OMB, OFPP, VARIOUS AGENCIES INVOLVED IN THE PROGRAM, AND HAS MET WITH SEVERAL SMALL BUSINESS HIGH TECHNOLOGY CONSULTANTS AND COMPANIES.
- O REVIEWED AND EVALUATED COMMENTS PROVIDED IN A DRAFT POLICY DIRECTIVE, AND PUBLISHED IN THE FEDERAL REGISTER ON NOVEMBER 24, 1982, THE FINAL POLICY DIRECTIVE IMPLEMENTING THE SBIR PROGRAM.

OUR OUTREACH EFFORTS INCLUDE THE PUBLICATION OF A BROCHURE EXPLAINING THE SBIR LEGISLATION, AS WELL AS THE OPERATION OF THE PROGRAM. OUR INITIAL SUPPLY OF THIS PUBLICATION (OVER 50,000) WAS DEPLETED IN SUCH A SHORT TIME THAT ADDITIONAL PRINTINGS WERE NECESSARY IN ORDER TO MEET THE DEMAND. AS AN INDICATION OF THE INTEREST WHICH THIS PROGRAM HAS GENERATED, SBA IS STILL RECEIVING OVER 500 LETTERS A WEEK, AS WELL AS ANSWERING OVER 300 PHONE CALLS.

SBA HAS PARTICIPATED IN NUMEROUS TELEVISION AND MEDIA PUBLICITY EVENTS AND HAS PARTICIPATED IN CONFERENCES NATIONWIDE ON THE SBIR PROGRAM.

THE OFFICE OF INNOVATION, RESEARCH AND TECHNOLOGY HAS DEVELOPED AND IS CONTINUING TO COMPILE, A MAILING LIST OF SMALL FIRMS NATIONWIDE WHO WISH TO PARTICIPATE IN THE SBIR PROGRAM, INCLUDING SOME FIRMS FROM SBA'S PROCUREMENT AUTOMATED SOURCE SYSTEM (PASS). THIS LIST CURRENTLY HAS OVER 25,000 SMALL BUSINESS FIRMS AND IS GROWING RAPIDLY.

SBA HAS MAILED OUT TO INTERESTED CONCERNS PRE-SOLICITATION ANNOUNCEMENTS LISTING RESEARCH TOPICS AVAILABLE FROM THREE AGENCIES INVOLVED IN THE SBIR PROGRAM. A SECOND MAILING IN FEBRUARY WILL INCLUDE THREE MORE AGENCIES. WE ANTICIPATE THAT BY MARCH 31, 1983, PRE-SOLICITATION ANNOUNCEMENTS WILL HAVE BEEN MAILED FOR THE REMAINING AGENCIES.

MR. CHAIRMAN, THIS COMPLETES MY REVIEW OF THE IMPORTANCE OF INNOVATION IN ECONOMIC GROWTH, THE IMPORTANCE OF SMALL TECHNOLOGY-BASED FIRMS IN INNOVATION, AND THE RELATIONSHIPS BETWEEN SUCH FIRMS AND THE FEDERAL GOVERNMENT. I SHALL CONCLUDE AS I BEGAN, WITH THE RECOMMENDATION THAT ANY POLICIES THIS COMMITTEE MAY RECOMMEND TO FURTHER ENCOURAGE THE GROWTH OF NEW TECHNOLOGY BASED INDUSTRIES, BE DESIGNED TO REAP THE BENEFITS OF THE ABILITIES OF SMALL HIGH TECHNOLOGY FIRMS.

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SOME IMPORTANT INNOVATIONS BY U.S. MAIL FIRMS
IN THE TWENTIETH CENTURY

Acoustic Suspension Speakers
Aerosol Can
Air Conditioning
Airplane
Artificial Skin
Assembly Line
Automatic Fabric Cutting
Automatic Transfer Equipment
Bakelite
Biosynthetic Insulin
CAT Scanner
Catalytic Petroleum Cracking
Continuous Casting
Cotton Picker
Double-Knit Fabric
Electrical Wire Nuts
Electronic Calculator
Fiber Optic Examination Equipment
Geodesic Dome
Gyrocompass
Heart Valve
Heat Sensor
Helicopter
Heterodyne Radio
High Capacity Computer
Hydraulic Brake
Learning Machine
Link Trainer
Optical Scanner

Oral Contraceptives
Outboard Engine
Overnight National Delivery
Personal Computer
Photo Typesetting
Piezo Electrical Devices
Polaroid Camera
Precast Concrete
Prefabricated Housing
Pressure Sensitive Adhesive Tape
Safety Razor
Soft Contact Lens
Sonar Fish Monitoring
Strain Gauge
Strobe Lights
Vacuum Tube
Variable Output Transformer
Xerography
Zipper

Note: An innovation is the first sale using a discovery. A small firm is defined as having less than 500 employees.

Source: Compiled by the Office of Economic Research, Office of Advocacy, U.S. Small Business Administration, February 17, 1982.



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

ACCOUNTING AND FINANCIAL
MANAGEMENT DIVISION

B-206827

The Honorable Lloyd Bentsen
United States Senate

Dear Senator Bentsen:

In your August 10, 1981, letter you expressed the view that the venture capital approach to innovation is critically important to this country's economic and productivity well-being. Based on a briefing we provided your staff on the venture capital "process," you requested a report giving our findings, conclusions, and recommendations on this subject.

Our study showed that even though venture capital was relatively scarce during the 1970s, it contributed significantly to the Nation's economic and productivity well-being. And venture capital is more readily available now, creating the prospect of potentially greater contributions to the Nation's economy in the 1980s. Yet, if the venture capital now available is to make its greatest contribution, both Government and the venture capital industry must be alert to other issues that will influence whether the complex venture capital process works successfully. For example, a question exists as to whether the number of experienced venture capitalists able to deal with the increased capital supply is sufficient. To ensure that all relevant issues affecting the venture capital process are addressed, dialog between the Government and the industry must be improved.

Our conclusions are based on views expressed by a wide range of individuals and organizations either involved in or familiar with the venture capital process. We also employed a contractor to study the experiences of 1,332 companies that were established in the 1970s with venture capital backing. The results of the contractor's study, coupled with our own independent research and analysis, provided a good, overall picture of the venture capital process, as well as an appreciation of venture capital's contribution to the economy and the various factors that influence the process. Appendix I provides further details on the objectives, scope, and methodology of our review, and appendix II provides details of our findings. Appendix III is a case study of the contributions of one small, high-technology firm to productivity. Appendix IV is the National Venture Capital Association's response to our draft report, and appendix V is the Commerce Department's response.

VENTURE CAPITAL HAS CONTRIBUTED TO THE
NATION'S ECONOMY AND IMPROVED PRODUCTIVITY

The venture capital process, when working successfully, can improve the Nation's economy and enhance its productivity growth. Improvements achieved through this process in the 1970s were many and varied, despite the limited availability of venture capital.

The experiences of 1,332 companies that were started with venture backing during the 1970s demonstrate benefits to the Nation's economy and productivity that are disproportionately large when compared with the amounts of capital invested. For example, with \$209 million invested to create 72 of these firms, their combined sales in 1979 alone totaled \$6 billion. ^{1/} Growth in annual sales averaged 33 percent a year and, in the process, these firms created (1) an estimated 130,000 jobs, (2) over \$100 million in corporate tax revenues, (3) \$350 million in employee tax revenues, and (4) \$900 million in export sales. Moreover, most products were productivity enhancing, such as computer related equipment, fiber optics, industrial controls, lasers, robots, word processors, and numerous others. Productivity gains resulted from the diffusion of such products into the design and manufacturing operations of a wide variety of industries.

These results were even more notable in view of the relative scarcity of venture capital at the time. For example, between 1969 and 1975

--the private capital committed to venture capital firms declined from about \$175 million to about \$25 million annually and

--investments by venture capital firms declined from nearly \$500 million to about \$250 million annually.

CURRENT AVAILABILITY OF VENTURE CAPITAL
CREATES OPTIMISTIC OUTLOOK

Venture capital is more readily available now than it was in the 1970s, and prospects for the future are good. Thus, the

^{1/}Our concentration on 72 firms whose stock had "gone public" (traded in public stock exchanges) by 1979 does not mean the remaining 1,260 firms were as successful, nor does it mean they were business failures. Since most new companies take 5 to 7 years to go public, sufficient time had not elapsed to determine final outcomes. However, according to venture capitalists, about 20% of venture backed companies achieve public market success, about 40% achieve success through upward mergers into larger firms, and about 20% become profitable but continue to operate as small, privately held businesses. The rest, approximately 20%, are deemed business failures.

potential benefits to the Nation's economy and productivity growth are great. (Within the context of this report, the existence of certain offsetting factors should be recognized. These factors reduce the aggregate economic benefits from the increased flow of funds into venture capital because some of those funds would have gone into other activities that also benefit the economy. It is not possible to precisely estimate the net effect of the venture capital process, and no attempt was made to do so.)

The \$657 million in new capital committed to venture capital companies in 1980 represented an increase of nearly 400 percent above the \$197 million committed in 1979. Commitments for 1981 were approximately \$1 billion with a similar amount expected in 1982. The largest investors are, in order: pension trust funds, major corporations, individuals and families, endowments, insurance companies, and foreign investors.

Venture capitalists are confident that the current trend in availability of venture capital will continue. It is expected to be a driving force for innovation in the 1980s. But even if capital remains available, other factors will determine whether the venture capital process works successfully.

BOTH GOVERNMENT AND INDUSTRY CAN INFLUENCE HOW WELL THE PROCESS WORKS

Because of the important potential benefits that could be obtained from available venture capital, both the Government and the industry have a stake in seeing that the process works successfully. Coincidentally, actions by either or both can influence whether the complex and sophisticated venture capital process will work successfully.

Government role is seen as critical by the industry

Individuals and organizations familiar with the venture capital process believe that Government plays a key role in influencing how much venture capital is available. They also believe that Government actions increasing or decreasing capital can produce unintended side effects. However, it is extremely difficult to clearly identify all the factors--economic, political, technological, psychological, and others--that influence the flow of venture capital or the venture capital process itself.

Many venture capital advocates believe that Government actions produce both direct and indirect effects on the venture capital industry that can be felt over a long time. For example, many knowledgeable individuals point to a series of tax policy changes, beginning with the Tax Reform Act of 1969 and culminating with the Tax Reform Act of 1976, which ultimately increased the maximum marginal tax rates on capital gains from 25 percent before 1969 to as much as 49 percent by 1976. The 1976 act also significantly

altered the tax treatment of stock options. Venture capitalists believe these policy changes led directly to a decrease in available capital between 1969 and 1975. For example, as noted earlier, investments by venture capital firms during that period declined from nearly \$500 million to \$250 million annually.

Further, venture capital advocates tend to view these tax policy changes as causing a series of ripple effects:

- Recognizing that their chances for obtaining risk capital were extremely limited, entrepreneurs became less inclined to present new business proposals to venture capitalists.
- The increased capital gains tax rate, coupled with elimination of qualified stock options, gave top management talent little, if any, incentive to abandon secure careers and enter into new business ventures.
- Rather than starting new businesses, venture capitalists began investing in or buying out existing enterprises to lessen their risks and shorten their investment periods.
- Because the lack of capital caused a reduction in the number of venture capital firms, the opportunities for encouraging and training new entrants into the venture capital industry were limited.

Aside from tax policies, other Government actions can influence the venture capital process in more subtle ways. For example, when Government so much as suggests a rule change, the industry sometimes reacts unexpectedly. In 1979 the Department of Labor published a proposed regulation change in the Federal Register for pension trust fund participation in venture capital investments. According to a Department of Labor official, the Department's intention in proposing the change was to elicit industry views on ways to increase pension fund participation in venture investing. Legal counsel for various pension funds, however, interpreted the language as creating a "personal" fiduciary responsibility for the trust fund manager. As a result, many trust fund managers shunned venture investments, with many continuing to do so as late as mid-1981, even though the Labor Department's intent had been to increase--not decrease--venture participation.

Venture capital experts believe the current availability and growth of venture capital result primarily from Government action which (1) reduced the capital gains tax from 49 percent to 28 percent in 1978, (2) relaxed pension trust fund investment rules in 1979, and (3) further reduced the maximum capital gains tax for individuals from 28 percent to 20 percent in 1981. In the experts' opinion, these policy changes have created incentives for risk taking not seen in the United States since 1969. Nevertheless, this significant and relatively sudden turnaround in the availability of venture capital causes essentially the same ripple effect but in the opposite direction.

In the opinion of venture capitalists, these examples typify how Government actions influence the availability and flow of venture capital, its use over protracted time, and the sensitivity of the industry to Government actions.

Complex venture capital process also requires sophistication and skill within the industry

Although the Government's role is seen as critical, the venture capital industry itself has a complex and sophisticated role. Managing the process involves many important actions and difficult decisions which influence how successfully the process works.

Venture capitalists seek out new technology, entrepreneurial talent, and management resources and combine them for new business opportunities that have significant market growth potential. They are faced with hundreds of difficult technical and judgmental decisions, any of which can translate into millions of dollars gained or lost for their investors. Venture capitalists must know myriad laws and regulations on such topics as tax, securities, and incorporation, and must be able to sense a valid market niche and to find, judge, and acquire needed management talent. They must also be able to raise millions of dollars quickly. Finally, they must be able to orchestrate all these activities so that the venture-backed company achieves its public market or upward merger goal within a planned timetable.

Clearly, the role of the venture capitalist is far more than that of a supplier of capital to an entrepreneur to develop and market products. There is some question, however, as to whether the number of experienced venture capitalists available to manage the growing supply of venture capital will be enough.

A matter of industry-Government concern:
Are more venture capitalists needed?

There has been concern in the industry that the number of experienced venture capitalists may not now be sufficient or may not keep pace with the growing availability of venture capital. Because venture capitalists continue to actively participate in managing each venture they help to create, their primary constraint is the number of firms they can manage--not the amount of capital they can raise. Without an adequate number of experienced and professional venture capitalists, the venture capital process cannot work to its full potential in benefitting the Nation's economy, even when ample capital is available.

When little venture capital was available during the 1970s, the number of experienced venture capitalists decreased. That number may not now be adequate to manage the growing supply of venture capital in the 1980s. The possibility exists, therefore, that less experienced individuals may be attracted to the industry, creating the possibility that those inexperienced venture

capitalists may make less sound decisions than those with experience. This would hurt the industry's image and lessen the success of the process. To avoid this, professional standards must be strengthened to ensure that new entrants are fully qualified to manage the process.

BETTER GOVERNMENT-INDUSTRY DIALOG COULD
IDENTIFY AND RESOLVE KEY ISSUES
AFFECTING THE PROCESS

Two major indications suggest that improved dialog between Government and industry may be needed:

- Many venture capital advocates believe the Government is not fully aware of how its actions influence the process.
- The range of issues and the degree to which Federal involvement can affect the venture capital process are great, but no single office or congressional committee has total jurisdiction.

In this environment, key issues--such as what is an appropriate number of experienced venture capitalists--may not be adequately addressed.

The National Venture Capital Association is a major representative of the industry. In addition, other industry spokespersons represent the industry before the Congress and other Federal offices. Yet, many venture capital advocates believe the Government is not always sufficiently aware of the impact of governmental actions on the venture capital process. For example, some believe that the Government may not have fully considered, before enactment, the adverse impact the Tax Reform Act of 1969 and subsequent changes would have on the venture capital process.

Within the Government, many offices can potentially affect the venture capital process through their actions. Actions that affect the process can be the result of executive or congressional initiatives. Tax policies are a clear example; labor and regulatory policies are others. Yet, no central point of coordination exists for Government actions that affect the venture capital process.

We are not in a position to agree or disagree with the view of some venture capital advocates that Government policymakers are not sufficiently aware of how their decisions affect the venture capital process. Nor would we argue for establishment of a single Federal office to monitor the impact of all relevant policies on that process. Even so, a case for better industry-Government dialog can be made, since both sides stand to gain by sharing information and viewpoints on how the venture capital process can help the economy and productivity growth.

CONCLUSION

The venture capital process can greatly contribute to the Nation's economy and can significantly improve productivity in the 1980s. The supply of venture capital is increasing and prospects for future growth are good. However, to achieve the greatest benefits from the availability of capital, both the industry and the Government need to properly deal with other issues that will influence how well the complex venture capital process translates available capital into economic and productivity gains. Better dialog between Government and industry is needed to jointly identify pertinent issues and to suggest actions needed by either or both to create the greatest likelihood of a successful venture capital process in the present environment of increasing capital supply.

We have no specific recommendations to make at this time. However, congressional hearings could be used to determine how Government-industry dialog can be improved and to identify and discuss other important issues, such as the role of the venture capitalist, that will influence how well the venture capital process succeeds in the 1980s. Such questions could be addressed as:

- What kind of forum or mechanism, if any, would be agreeable and beneficial to both Government and industry in exchanging views on current or proposed policies, rules, and regulations affecting the venture capital process?
- Should such a forum or mechanism be established on a permanent or an ad hoc basis?
- Where should such a function be housed, in the legislative or executive branch or both?
- What form of industry participation would be most effective in identifying and addressing issues sensitive to the venture capital process, e.g., individuals or representatives from the National Venture Capital Association or other organizations?
- What is the possibility of too few experienced venture capitalists? If the possibility is great, how does industry propose to alleviate the potential shortage?
- Does Government have a role in assisting the venture capital industry?

We believe that open discussion of these and similar questions could result in an agenda for specific action by both Government and industry to strengthen the venture capital process.

AGENCY AND INDUSTRY COMMENTS

Although the Small Business Administration and the Departments of Labor and Treasury did not formally respond to the draft report, they reviewed and provided needed information to clarify and correct portions of this report. The Department of Commerce agreed with the thrust of the report.

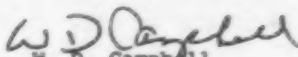
The draft report was reviewed by several knowledgeable individuals in the venture capital industry. We requested and received a formal reply from the National Venture Capital Association to represent industry's views on the report.

We deeply appreciate the assistance of individuals and companies in the industry and individuals in Federal agencies whose contributions were invaluable to this study. We are particularly grateful to Venture Economics of Capital Publishing Corporation for providing access to its proprietary data on venture capital activity in the United States.

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As arranged with your office, subsequent distribution of this report will be delayed until you announce its release, or 30 days from the date of the report, whichever occurs first. At that time we will send copies to interested parties and make copies available to others upon request.

Sincerely yours,


W. D. Campbell
Director

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ABBREVIATIONS

CAD/CAM	Computer aided design/computer aided manufacturing
ERISA	Employee Retirement Income Security Act
GAO	General Accounting Office
SBIC	Small Business Investment Company

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OBJECTIVES, SCOPE, AND METHODOLOGY

The objectives of our review were to (1) provide a fuller understanding of the venture capital process, (2) assess the potential impact of the venture capital process on the Nation's productivity and economic growth, (3) explore the applicability of the process to Government policies, rules, and regulations, and (4) seek alternative courses of action for both Government and industry to stabilize the venture capital process over the long term.

The study included data on 1,332 venture capital backed companies in which investments were made between 1970 and 1979. These data were acquired under contract with Venture Economics, a division of Capital Publishing Corporation, Wellesley Hills, Massachusetts. The data are unique in that they are the only known historical record of venture capital backed firms in the Nation, and have been accumulated over the past 20 years. The data are also proprietary, which means we could discuss company information only in those situations where the stock of the venture backed firms is traded in the public stock exchanges. Detailed company information gathered for this study, therefore, concentrated heavily on 72 firms that had "gone public" by the end of 1979 because information on publicly held corporations is available to the public. So that proprietary rights were not breached, only summary information was gathered on the other 1,260 companies.

Information describing the venture capital process and the impact of Government policies, rules, and regulations on the process was obtained through discussions with general partners of several venture capital companies and with other knowledgeable individuals in Government and industry.

We made extensive reviews of available literature, including dozens of reports, hundreds of articles, and the published proceedings of numerous panel discussions. We also participated in several conferences and panel discussions.

THE VENTURE CAPITAL PROCESS--
A UNIQUE FREE-ENTERPRISE APPROACH
TO ENTREPRENEURIAL ACTIVITY
IN THE UNITED STATES

INTRODUCTION

Much has been written and debated during the last several years about declining entrepreneurial spirit in the United States and the lack of willingness on the part of American business enterprise to take risks. Similarly, debate has continued about how small, high-technology companies have affected productivity and overall economic growth. Part of this debate has centered on the role of venture capital in creating new high-technology companies.

High-technology venture capital investments are unique

The term "venture capital" is commonly taken to mean any or all forms of investment in business enterprises. For this report to have relevance or even to be understood, it is essential to distinguish between the venture capital process to create high-technology, high-growth firms, and all other forms of venturing. There are significant differences, for example, in the scope of investment, degree of risk, extent of risk analysis, goals and objectives of investors, economic and financial return on investment, extent of investor participation in managing the firm created, and the form investments take--whether through debt or equity financing. The venture capital process discussed in this report is unique to a relatively small segment of the total financial investment community, which comprises about 130 venture capital firms that manage a total private capital pool of nearly \$3 billion. This segment specializes in creating high-risk, high-technology portfolio businesses, which, when successful and compared to other forms of venturing, pay exceptionally high economic returns in job creation, exports, tax revenues, and returns on invested capital.

The approach, goals, rationale, and mode of operating differ considerably from those of commercial banks, small business investment corporations, savings and loan institutions, investment banks, and brokerage houses, and from the hundreds of individuals and firms classified as venture capitalists but whose investments tend to specialize in such areas as real estate, building development, wholesale/retail operations, franchise businesses, oil and mineral exploration, and others.

While some functions are common among these diverse sources, no other segment of the financial marketplace that we could determine performs all of the functions done systematically by this small group of high-technology specialists. No other segment

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invests with the specific intention of remaining actively involved in business operations for extended periods, often as long as 10 years. In short, the venture capital process described in this report has become an increasingly unique force in our economy.

This appendix is in six parts:

- Part I provides the history and current state of the venture capital pool.
- Part II demonstrates the disproportionate effect of the venture capital process on productivity and economic growth.
- Part III describes how the process works.
- Part IV addresses the sensitivity of the process to Government regulations, rules, and policies.
- Part V discusses prospects for the future.
- Part VI discusses an approach for stimulating the process and for maintaining an environment conducive to entrepreneurial activity through Government-industry interaction.

PART 1HISTORY AND STATE OF VENTURE CAPITALEVOLUTION OF THE VENTURE CAPITAL INDUSTRY

Venture capital investment was instrumental in the early development and industrialization of America. Before World War II, venture investments were the province of wealthy individuals, syndicates organized by investment bankers, or a few family organizations employing professional managers. Although many government studies in the 1930s and 1940s expressed concern about the problems of financing small businesses, institutionalization of the venture capital process did not start until after World War II with the formation of Boston's American Research and Development Corporation in 1946.

The next major milestone in the industry's development was the enactment of the Small Business Investment Act of 1958, which provided for the creation of Small Business Investment Companies (SBICs). These provided tax advantages, potential Government lending leverage, and a vehicle designed for small business financing and thus became the first phase of a true venture capital industry.

THE INDUSTRY AS IT IS TODAY

The industry today is made up of three types of firms: private venture capital companies, SBICs, and subsidiaries of major corporations.

Private venture capital companies

These are the dominant institutionalized source of classic venture capital activity. Most are limited partnerships, usually with two to four general partners and several sophisticated investors as limited partners. To a lesser extent, they are closely held corporations. As of about mid-1982, an estimated 130 private venture capital firms existed in the United States, funded by pension trust funds, major corporations, insurance companies, endowment funds, wealthy individuals, and foreign investors.

Private firms generally begin by raising a venture fund ranging from \$15 million to \$100 million--roughly three times the size of typical funds during the 1960s and early 1970s. The time required to place these funds into promising ventures and then to see them mature to fruition usually dictates a life expectancy for a fund of about 10 to 12 years.

Small Business Investment Corporations

About 360 private and public firms are licensed as SBICs by the Federal Government; they are structured according to the program established by the Small Business Investment Act of 1958.

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They usually have minimum equity capital of \$500,000 with access to Government loans to achieve 3-to-1 or 4-to-1 leveraging.

Corporate subsidiaries

In the last 10 years, about 75 to 100 major corporations have made venture capital investments. These include both financial corporation venture capital subsidiaries, such as Citicorp and Allstate, and large industrial corporations, such as Xerox, Exxon, and General Electric, that have formed venture capital divisions.

SIZE OF THE VENTURE CAPITAL INDUSTRY

With major impetus from the Revenue Act of 1978, which reduced the capital gains tax from 49 percent to 28 percent, dramatic expansion of the industry began and continues today. Although there are fewer active industry participants than at the beginning of the last decade, the surviving core is well capitalized and can participate in a wider range of situations.

The total venture capital pool--the amount of funds committed to venture capital investment--has expanded from about \$2.5 billion in 1977 to nearly \$6 billion by the end of 1981.

<u>Source of funds</u>	<u>Amounts (billions)</u>
Private venture capital firms	\$2.6
Small business investment companies	1.6
Corporate subsidiaries (financial and nonfinancial)	<u>1.6</u>
Total	<u>\$5.8</u>

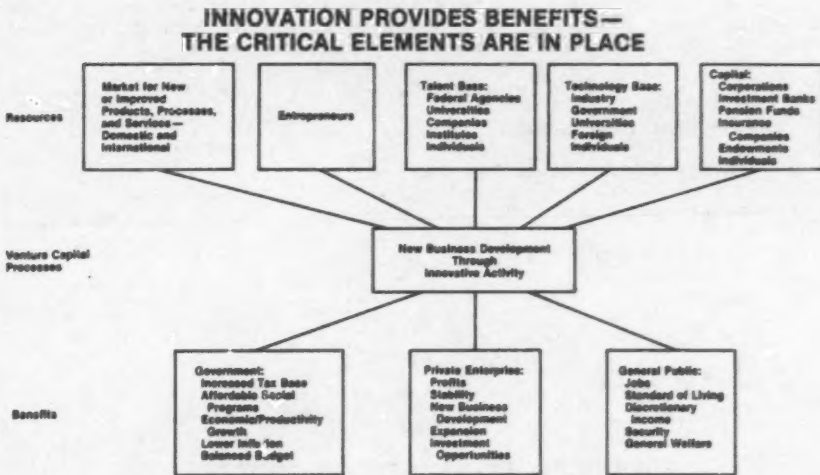
This pool remained static from 1969 to 1977 at some \$2.5 billion to \$3 billion, with new fundings more or less equal to withdrawals, before expanding by more than \$1 billion from 1978 to 1980 and an estimated \$1 billion in 1981.

CRITICAL ELEMENTS
OF THE VENTURE CAPITAL PROCESS

The process epitomizes the American free enterprise system through a highly sophisticated, methodological approach of combining technology, entrepreneurial talent, and capital resources to meet an identified market need.

Chart 1 indicates that all the critical elements needed for successful venture capital activity exist in the United States. The venture capital industry, in turn, can provide benefits to the Nation vastly disproportionate to its size.

Chart 1



This study is based on the experiences of 1,332 companies in which venture capitalists invested \$1.4 billion from 1970 to 1979. The study showed that, in addition to limitations on and rewards from the process from a Government policy standpoint, benefits accrue from a productivity improvement point of view.

Historically, the most important source of productivity growth has been the application of new technology to the production of goods and services. Economists have attributed more than half of the net productivity growth during 1947 to 1977 to technological advances.

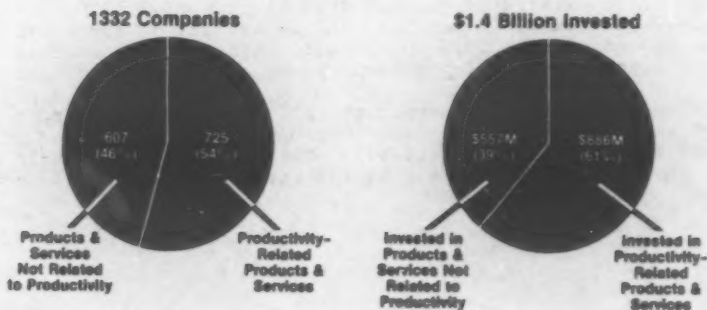
PART 2THE VENTURE CAPITAL PROCESSPROVIDES MAJOR CONTRIBUTIONS TO THE ECONOMYPRODUCTIVITY ENHANCING PRODUCTS AND SERVICES
BEST FIT VENTURE CAPITAL CRITERIA

Products, systems, and services that are productivity enhancing best meet venture capital criteria for investment. Note in chart 2 that 54 percent of the ventures and 51 percent of the capital went to companies offering productivity related products, systems, and services. These included a wide range; to name a few:

- Automatic testing equipment.
- Computer peripherals.
- Energy conservation devices.
- Fiber optics.
- Industrial controls.
- Lasers.
- Robotics.
- Word processors.

Chart 2

**PRODUCTIVITY-RELATED PRODUCTS
& SERVICES**
**BEST FIT VENTURE CAPITAL
CRITERIA**



SOURCE: Venture Economics

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For each \$1,000 of venture capital invested during the 1970s, an estimated \$40,000 to \$54,000 worth of productivity enhancing products and services will be sold during the 1980s.

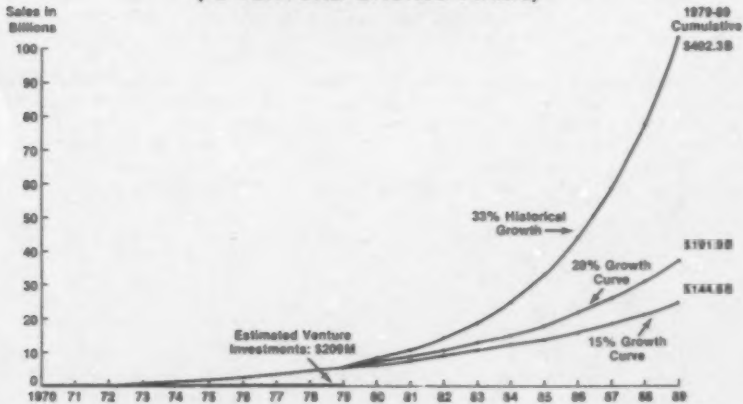
DISPROPORTIONATE BENEFITS IN PRODUCT SALES

To demonstrate the disproportionate benefits from the venture capital process, chart 3 shows the growth in sales of 72 firms backed by about \$209 million in venture capital during 1970 to 1979. In 1981, these firms were all under 12 years old. They were predominantly high-technology companies whose products were designed, manufactured, and marketed specifically to increase the productivity of the firms buying them.

The products are typically computers or computer related hardware and software used to improve manufacturing processes, computer related products that improve information handling and storage, new or improved medical equipment and devices, precision measurement devices, and other high-technology products. Productivity can be improved by reducing labor content, reducing processing time, improving quality of products or services, eliminating certain functions altogether, or shortening the new product development or manufacturing cycle by automating highly complex design and manufacturing tasks. It was not possible to fully measure improvements in most of these functions, but on a case-by-case basis, productivity increases in labor alone ranged from 10 to over 50 percent.

Chart 3

DISPROPORTIONATE BENEFITS— PRODUCT SALES (72 VENTURE-BACKED FIRMS)



SOURCE: Venture Economics and GAO Est.

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By 1979, these 72 firms were trading in public markets, ^{1/} which means their respective growth records were high and they were able to obtain equity capital through public stock sales. "Going public" is a critical milestone to the venture capitalists. In fact, going public is a primary goal because this form of liquidity usually provides the highest return on invested capital.

Combined sales of these 72 firms totaled more than \$6 billion in 1979. Their growth in sales averaged 33 percent a year. The sales projections through 1989 are shown on chart 3 and are based on three different assumptions. The most optimistic curve shows continued growth at the firm's historical rate of 33 percent a year. The other two curves, based on sales growth of 20 and 15 percent, respectively, were calculated for no other reason than to be conservative, with the expectation that actual growth is likely to fall somewhere between the high and low curves.

At some point in a company's life cycle, of course, sales will level out, depending on many factors. However, since we were addressing the creation and early growth of firms, as opposed to the maturation period, we considered these curves realistic. For example, a primary objective of a firm seeking equity capital from public stock issues is to raise capital for expansion. This translates into more production, more product lines, more sales, more acquisitions, and so forth, all of which could occur within the span of time shown in the chart.

Stated simply, a new firm's ability to do well during its first 5 to 7 years generally determines its ability to go public. Its ability to go public, in turn, dictates how much and how rapidly it can expand. The resulting benefits to the Nation--such as jobs, tax revenues, and trade--multiply at an increasing rate as companies expand through more production and sales, through research on and development of new technology and new product lines, and through acquisitions for greater liquidity and stability.

If the projected optimistic growth rate of 33 percent were sustained through 1989, as shown in chart 3, sales by these 72 firms could exceed \$100 billion a year; cumulative sales for the period could approach \$400 billion. Even in the conservative range, annual sales would range from \$24 billion to \$37 billion and cumulative sales would range from \$145 billion to \$192 billion.

^{1/}Information on publicly held corporations is more readily available than on privately held corporations. This explains our concentration on the 72, rather than 1,332 venture-backed firms, to demonstrate economic benefits.

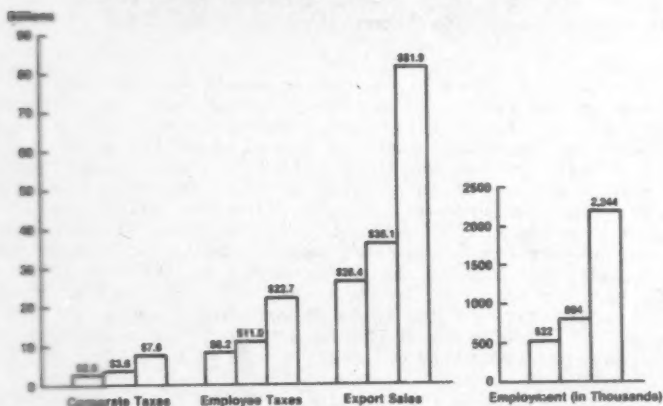
OTHER BENEFITS--TAX REVENUES,
EMPLOYMENT, AND EXPORT SALES

In addition to direct benefits to venture backed companies and their investors, other benefits accrue to the economy. Using very conservative approaches, 1/ chart 4 shows that by 1989, corporate taxes of these 72 firms alone could range between \$3 billion and \$8 billion annually, employee taxes from \$8 billion to \$23 billion, export sales from \$26 billion to \$82 billion, and jobs from a half million to 2-1/2 million workers.

Some economists argue, quite correctly, that these estimates overstate the benefits because they fail to account for the product sales, jobs, etc., of firms whose products are displaced. We

Chart 4

**OTHER BENEFITS—TAXES,
EMPLOYMENT AND EXPORTS**



1/Using the "Statistical Abstract of the United States," national average figures on corporate taxes, employee taxes, and export sales were compared to overall sales to derive what we consider to be conservative projections. For projecting employment, we developed a ratio of employment to sales for several industry sectors and selected the sector yielding the lowest number of employees: radio and television receiving set manufacturing.

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made no attempt to calculate the net benefits. Instead, we gave credence to the theory of Harvard economist Joseph A. Schumpeter, who maintained that a capitalist economy grows by a process he called "creative destruction"--combining entrepreneurial innovations with technological investment to create new growth industries. This process inevitably inflicts displacement and distress on older, less dynamic businesses. The process, nevertheless, does provide economic growth. Moreover, in today's world market economy, it can be argued that if this process were not generated internally by U.S. entrepreneurs, it probably would be generated by our international competitors and inflict even greater economic displacement and distress.

After considering these factors and recognizing there was no intent to make these projections absolute, we concluded that the venture capital process is fully justified, provides benefits, and is needed by the Nation.

AGGREGATE POTENTIAL BENEFITS FROM
VENTURE-BACKED COMPANIES

Assuming the other 1,260 firms achieve a modicum of the success enjoyed by the 72 publicly held firms, annual sales would undoubtedly total tens of billions of dollars by 1989, as indicated in chart 5.

The certainty of these projections cannot be guaranteed. However, one way of judging their validity is through the historical venture capital success/failure rate. Venture capitalists have claimed high-level success (growth warranting public stock issues) in about 20 percent of the ventures. If this rate holds true for all 1,332 firms--and we found nothing to indicate otherwise--we could expect high-level success by 226 firms, of which the 72 already discussed represent 27 percent. Using the most conservative projection of 15-percent growth per year rather than the 33-percent historical growth rate, successful firms during 1980 to 1989 could exceed \$500 billion in sales in constant 1979 dollars, corporate taxes could exceed \$10 billion, employment could approach 2 million workers, employee taxes could be \$30 billion, and export sales could reach nearly \$100 billion.

Not included in these calculations, however, are an additional 40 percent of the ventures which, according to venture capitalists, become profitable business enterprises but on a smaller scale. This usually means their growth and market expansion predictions did not materialize so neither did their prospects for going public. Many of these firms achieve upward mergers with larger firms; their products complement those of the larger firms and thus fit well into the larger firms' marketing strategies. Upward mergers also yield high returns on invested capital.

The projections of potential benefits also do not include portfolio companies that continue to operate as small independent companies.

Chart 5

**AGGREGATE POTENTIAL BENEFITS—1980-89
FROM 1332 VENTURE BACKED
COMPANIES—1970-79**

	<u>Annual by 1989</u> (In Billions)	<u>1980-89 Cumulative</u> (In Billions)
Sales	\$88.8	\$537
Corporate Income Taxes	.17	10
Employment	1.9 Million	N/A
Employee Taxes	5.0	30
Export Sales	13.6	100

Overall, there can be little doubt that the benefits to the Nation from the venture capital process during 1970 to 1979 are truly disproportionate to the \$1.4 billion originally invested in these 1,332 firms.

PART 3HOW THE VENTURE CAPITAL PROCESS WORKSCOMPONENTS OF THE PROCESS

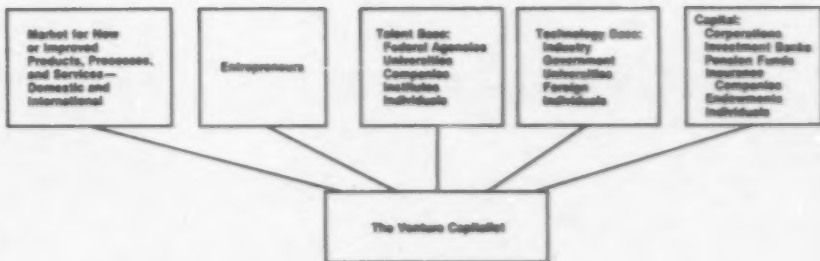
Three generic components make up the venture capital process:

- Technology that meets an identifiable market need.
- Talent that includes not only the entrepreneurs, but business managers, marketing managers, technologists, and others.
- Capital to develop a product, fund initial production facilities, and provide operating capital.

While chart 6 indicates the availability of the sources for these components, it does not begin to capture the complexities of the process by which the components are integrated. The key to integrating them is the venture capitalist and, more particularly, the portfolio manager. The impression that the venture capitalist merely supplies money to high-risk ventures is totally erroneous.

Chart 6

COMPONENTS OF THE VENTURE CAPITAL PROCESS



It is essential to understand that the driving force for the venture process, and the reason for describing it in detail, is the free enterprise profit motive. This portion of the report, therefore, is as much a description of the people involved as it is the process itself. Any conclusion that this is a mechanical process misses the mark. The process involves people, which is to say it

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involves egos, personal drive, judgment, knowledge, experience, skills, and business savvy. These characteristics vary from person to person and are difficult, if not impossible, to describe accurately.

VENTURE SELECTION PROCESS

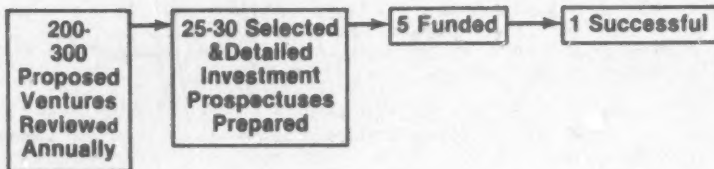
Very few business proposals presented to venture capitalists meet the stringent criteria for investment--assessments of the technology, markets, people who will be managing the enterprise, and business plans.

Chart 7 depicts the typical selection and screening process followed by each of the 130 top venture capital firms in the United States. Of 200 to 300 proposed ventures that a venture capital firm may review each year, about 90 percent are rejected during initial screening. About 25 to 30, or roughly 10 percent, are considered good enough for detailed analysis.

Analysis of these 25 to 30 business "packages" is significant because, according to venture capitalists (1) only five or six can be financed and managed by each of them at any one time and (2) the cost of analysis is high (top analysts are scarce and command daily fees of \$1,000 to \$1,500 for work that may range in scope from a few days to several months). Venture capitalists want to be able to select those packages offering the best prospects for success and/or the highest potential returns on investment.

Chart 7

VENTURE SELECTION PROCESS OF VENTURE CAPITAL FIRMS (PARTNERSHIPS — 100-125 FIRMS)



According to venture capitalists, the reason so few proposals are financed is a combination of the strict criteria applied, a dearth of or inaccessibility to highly competent management talent, the limited number of portfolio managers, and the risk-reward environment created by the Government.

Venture capital criteria--technical

Not all venture capitalists operate in exactly the same way, but some criteria are generic to the industry. These include assessments of the technology, market, management talent, and business plan.

Chart 8

VENTURE CAPITAL CRITERIA—TECHNICAL

- **Innovative or Unique Technological Applications**
- **Product Appeal That Yields High Profit Margin, e.g., Productivity Enhancing Products or Systems**
- **Competitive Variables of Technology and Applications Engineering (as Opposed to Economies of Scale Production/Price)**
- **Unexploited Spin-Off Opportunities**

In assessing the technical applications, the venture capitalist looks for an application of technology, whether new or not, that serves a unique purpose and, therefore, a unique and potentially fast-growing market.

A new product or new system should improve performance, increase the level of service, reduce costs, eliminate equipment needs, and so forth. For these reasons, productivity enhancing products, systems, or services are prime candidates for venture investments. All of the 72 firms discussed earlier produce and sell productivity enhancing products, systems, and services.

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The uniqueness of the product must yield a high profit margin so that the competitive advantage of the would-be new company comes from the technology itself or the unique engineering applications of that technology. This uniqueness provides an effective channel into the marketplace, and the high profit margin provides sufficient cash flow for operations as well as profits to plow back into research and development.

Finally, the venture capitalist looks for technology with the potential for other unexploited applications. Since the market life of a new product is often limited to 3 to 5 years, the venture capitalist wants a product out of which other products can be developed, using the same distribution channels for marketing.

Venture capital criteria--markets

The distinction between the technical assessment and the market assessment is often hard to find. If the technical application is unique, it is unique to an identifiable user community. That community must be identified and tested sufficiently to convince the venture capitalist that the new applications not only will improve performance of a function or delivery of a service, but will do so to the extent that prospective users will want to buy the new product or service.

The size of the user community must be large enough to offer growth potential to a new firm. The venture capitalist looks for a market niche of at least \$50 million to \$100 million to support future expansion. In exceptional cases a market may not exist but a basic economic need is identified. This adds tremendously to the risk of a venture but may produce a major success.

Venture capital criteria--talent

The most critical criterion to the venture capitalist is that the people running a new business enterprise must be fully competent to do so. A standard cliché in the venture capital community is that a company using second-rate technology with good management is a better investment than one using first-rate technology with bad management.

The venture capitalist looks for unique technical know-how because this can provide market leadtime over a competitor. The company that gets to the market with a competitive edge captures a large share of the market as well as the bulk of the profit earned in that market.

The management team must consist of a group of individuals experienced in the areas of expertise critical to success, not only in technology but also in manufacturing, marketing, finance, and overall management.

Chart 9**VENTURE CAPITAL
CRITERIA—MARKETS**

- **Identifiable Market Niche**
- **Relatively Easy to Measure**
- **High Growth Potential**

Chart 10**VENTURE CAPITAL
CRITERIA—TALENT**

- **Experienced Managers With Proven Track Records**
- **Balanced Team**
- **Sources of Talent**
- **Incentives for Acquiring Talent**

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Not uncommonly, the weakest part of a business proposal is the talent or management team itself. But by using many associations and connections, the venture capitalist often assists in locating and putting together a strong management team as a condition to raising the necessary capital.

Key members of the team are expected to have a high level of commitment to the enterprise; a "will to win"; a desire to become wealthy; a willingness to take risks; and, above all, personal integrity. To test the team's commitment, the venture capitalist often insists that team members make an investment in the new enterprise that is significant relative to their individual financial resources. While this may make the venture capitalist appear insensitive, venture capitalist philosophy holds that such a requirement is central to success.

A primary incentive to someone with recognized talent and experience is the opportunity of gaining part equity in a new firm. Although such a move represents a substantial risk on the part of a manager whose present income and job security are probably much higher than the new firm can offer, an ownership position in a new business enterprise whose success he or she can personally influence offers a chance for significant rewards. The value of founder stock or stock options received as a condition for joining a new enterprise, for example, can rise tenfold to twentyfold, depending on the success of the enterprise. The individual recognizes that success depends largely on all team members' initiative and drive.

Finally, the venture capitalist expects and usually insists on being part of the management team, ordinarily as a member of the board of directors. This mode allows the venture capitalist to assist the company with policies, strategies, financial advice, and so forth. This active involvement usually continues for at least 5 to 10 years. The lengthy period of active participation clearly sets the venture capitalist rationale apart from that of banks, SBICs, and other types of investors. Venture capitalists say they can participate actively in no more than five or six portfolio companies at any one time.

Venture capital criteria--business planning

The business plan prepared for the company must be realistic and achievable. It must include all the cost elements of running the business and conservatively project market penetration.

In practice, according to venture capitalists, cost estimates are often exceeded, while revenue and profit projections are rarely achieved, at least initially. Capital requirements projected in the business plan must provide for these contingencies. Otherwise, the company runs into serious cash flow problems, which in periods of high inflation and high interest rates can make success doubtful or impossible.

Chart 11**VENTURE CAPITAL CRITERIA—
BUSINESS PLANNING**

- **Planning Start Up and Early Growth**
- **Planned Expansion Through Public Stock Issue in 5-7 Years or Appropriate Equity or Long Term Debt Financing**
- **Cash Flow Projections**
- **Return on Investment Projections**
- **Staged Investments**

The market assessment and rate of penetration are extremely important. Market size and growth must enable the company to grow to about \$20 million in revenue and not less than 7 percent profit after taxes within 5 years. This growth and its timing are critical for later expansion via public stock sales or upward merger. During this period, capital availability must enable the company to develop to the point where additional capital can be raised from private sources for the next stage of development without value dilution. In other words, the company's actual performance must stay very near or exceed its projected growth so that its value increases in proportion to its size.

A final but critical projection is return on investment. Venture capitalists look for a prospective company with the ability to earn a compound rate of return on investment at least 20 percent greater than risk-free alternatives, such as secured loans and Treasury notes and bills. In this calculation, the time horizon is actually more significant than the capital requirement itself, because investment decisions consider the present value of dollars earned in the future. At the most frequently used discount rate of 15 percent, for example, the present value of a dollar earned 10 years from now is 24.7 cents; in 20 years, 6.1 cents; and in 30 years, 1.5 cents.

Using the present value method, it becomes readily apparent why business plans and strategies for new ventures use a maximum horizon of 5 to 7 years and, in turn, why maintaining the projected growth pattern to go public or merge upward within that time is critical to success. Otherwise, the extraordinarily high returns on investment are not achieved and investors may seek other avenues of investment.

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As inflation grows, investment decisions are forced into shorter and shorter time periods and long range investments simply are not made. A necessary role for Government, therefore, is to be continuously aware of the impact of inflation on investment decisions so that appropriate changes can be made in policies, rules, and regulations to maintain a healthy entrepreneurial environment for risktaking.

STAGES OF BUSINESS DEVELOPMENT AND INVESTMENT

It is important to see how a new venture progresses from an idea to a mature business enterprise. A successful business enterprise passes through six phases, each one distinctly different in size, capital needs, managers, the way it is affected by Government rules and regulations, and where it finds capital for operations, growth, and expansion.

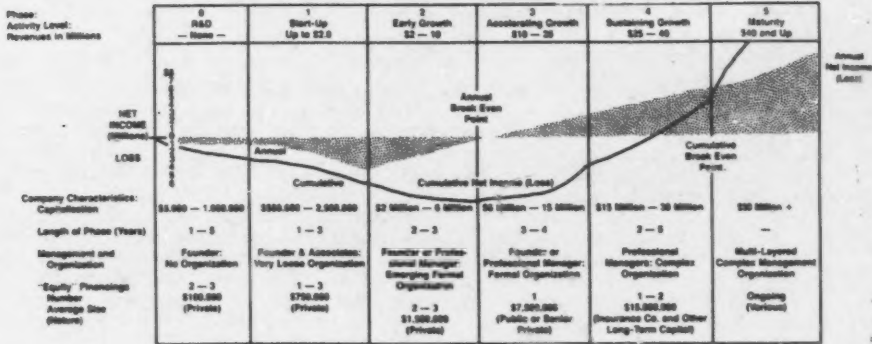
Chart 12 shows the life cycle of a new enterprise under fairly ideal conditions. The chart shows the kinds of milestones that must be met to proceed from one phase to the next, the kinds of activities that are occurring, what the sales and capitalization picture generally looks like, what the organizational structure looks like, and where capital resources come from. (The dollar figures used are very conservative. Depending on the complexity and sophistication of each business enterprise, dollar figures could be two or three times those shown in the chart.)

The research and development phase

Charts 13 through 17 describe each business development phase separately. The discussion is based on a hypothetical case because, since every new business faces somewhat different problems, it was not feasible to demonstrate all facets of business development through actual case histories. Appendix III, however, is an actual case history of a successful venture-backed company that experienced most of the elements described here. Information for this discussion was obtained and verified through discussions with several venture capitalists, entrepreneurs who had gone through this experience, and research of available literature and studies on the subject.

Chart 12

**LIFE CYCLE OF A NEW ENTERPRISE
MODEL OF A GROWING AND SUCCESSFUL COMPANY**



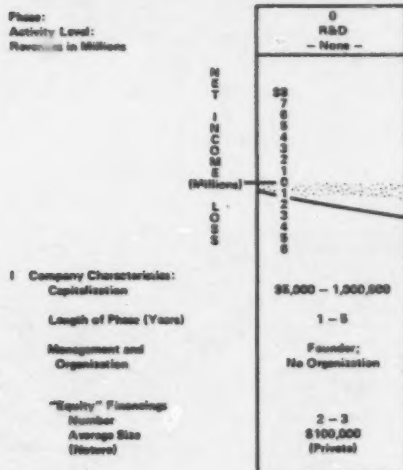
SOURCE: Small Business Administration

Assume that two or three bright scientists or engineers in an existing large company develop a good idea for a new product. The company, however, does not give the idea a high priority and the inventors decide to strike out on their own. (Such individuals could come from Government, universities, or research institutes, or simply be "garage" inventors.)

They pool their resources, maybe get additional support from family and friends, and proceed to develop their invention. This form of capitalization may raise enough money to last through product development, typically in some form of loose partnership. This phase may take 1 to 5 years, during which there is probably little or no income.

Chart 13

LIFE CYCLE OF A NEW ENTERPRISE
MODEL OF A GROWING AND SUCCESSFUL COMPANY
1975 - 1976 FINANCIAL MARKET CONDITIONS



Startup phase

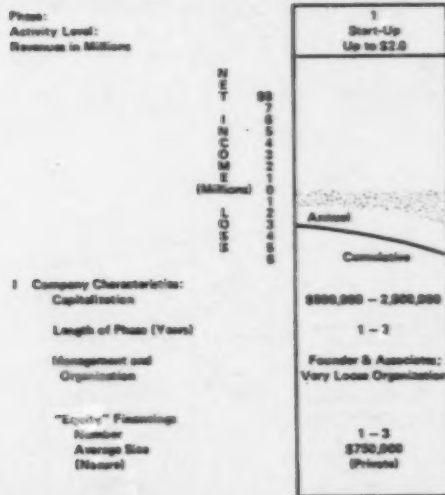
Once the inventors have their product developed and are ready to start their operation, they will need a large infusion of capital to build and equip a small production facility to serve a small and probably local market. The amount of capital needed may range from \$1 million to \$3 million. They may seek bank loans, but even if they can obtain this kind of debt capital, it is short term financing. The more short term loans they get, the worse their debt-to-equity ratio becomes. Each successive bank loan becomes more difficult to get, unless the company is exceptionally profitable, and in times of high inflation and high interest, the drain on cash flow from short term financing could quickly drive the new enterprise into bankruptcy.

What they need is permanent capital; in other words, they must sell equity. But since the new firm has no business record it cannot obtain investment bank or institutional funds, and it is too new to go public or merge upward.

At this point, the founders make up a business proposal and present it to a venture capitalist who reviews the proposal against

Chart 14

LIFE CYCLE OF A NEW ENTERPRISE
MODEL OF A GROWING AND SUCCESSFUL COMPANY



the venture criteria described earlier. If the proposal meets those criteria, the venture capitalist may be willing to fund the new enterprise in exchange for an equity position.

For many inventors and entrepreneurs, the share of equity that must be given up to the venture capitalist is a bitter pill to swallow. It may be 50 percent or more. What they learn, however, is that their growing portfolio company must dilute its equity, as well as that of the venture capitalist, in order to acquire the management team necessary to ensure business success in the long run. The growing venture-backed company will probably have to offer an equity position or attractive stock options to entice needed talent to give up secure positions for ones in which success depends entirely on skills and personal drive. This aspect quickly separates those individuals content to manage a small, independent business from those who aspire to build a significant growth business.

(The stock option provisions of tax law provide the United States one of the most effective and enviable incentives to entrepreneurship of any country in the world. A change in tax treatment of stock options in 1975 materially inhibited the flow of talent into new business enterprises. Those changes were reversed in 1981.)

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If the venture meets all criteria, the venture capitalist will raise the capital needed by the new firm in exchange for an equity position in the company. This first-stage financing is critical to the new firm because it provides enough capital to operate to a break-even or profit position, at which point it can obtain additional capital for expansion through bank loans or second-stage venture capital financing.

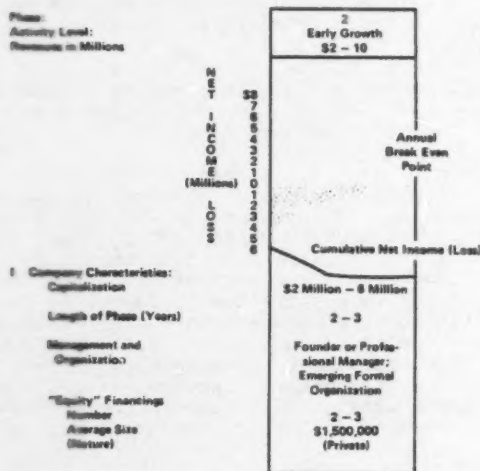
The new firm's organization becomes more structured, and startup--the time required to begin producing and selling a product--may take 1 to 3 years. The venture capitalist or portfolio manager serves as advisor, probably as a member of the board of directors.

Early growth phase

Assuming things have gone well to this point, the new firm may have reached annual revenues of \$2 million to \$3 million, perhaps approaching its maximum capacity within the existing business operation. If the market for its product looks good, it will now want to expand, requiring an even larger infusion of new capital--say \$1.5 million to \$2 million, or, in today's environment, \$3 million to \$5 million.

Chart 15

LIFE CYCLE OF A NEW ENTERPRISE MODEL OF A GROWING AND SUCCESSFUL COMPANY



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Again, its operation is not sufficient to attract a public stock offering, so the venture capital firm or group of firms may again supply the needed capital. This is second-stage financing. To raise this round of financing, growth in sales and earnings must have been sufficient to prevent value dilution. Otherwise, raising the needed capital may be difficult since the company may appear to be a questionable investment.

Having raised second-stage capital, the company is likely to require more key professional talent, both technical and managerial; a more formal organizational structure; and possibly expansion into new product lines. The question of incentives to new managers again comes into play. In addition, during the early growth phase, revenues must grow rapidly through increased sales, and earnings must exceed the break-even point within 24 months.

As discussed previously, these are critical milestones because they reinforce earlier projections of markets, growth potential, and return-on-investment calculations. But perhaps most important, progress to this point dictates success in the next phase: the new firm's move to acquire expansion capital through a public stock offering.

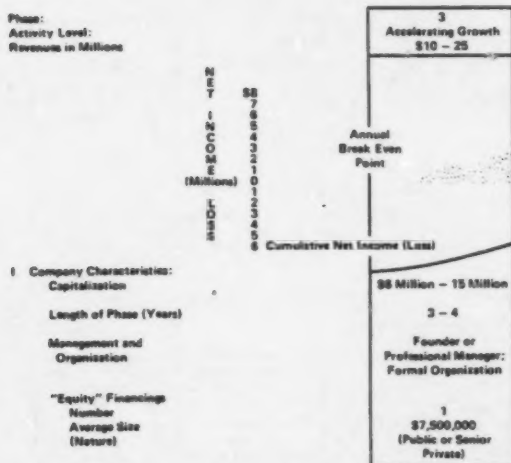
Accelerating growth phase

Now further expansion should occur, new product lines should be introduced, and a formal organization should be established. This is the phase that will determine whether the firm will grow and mature into a medium or large firm. A new and larger infusion of capital must now be raised through senior private placement or public offerings, say \$7.5 million to \$8 million on a conservative scale or as much as \$20 million to \$50 million in a more complex arrangement. Unless the company's performance record has met expectations, this level of new capital may not be available and venture capitalists may go into third-stage financing. If this financing is not forthcoming, the company stops growing or it merges with or is bought by another firm.

For the venture capitalist, liquidation is the payoff. The preference is a public offering or at least an upward merger. Both offer high returns to the investors to whom the venture capitalists are accountable. The venture capital firm should now be able to either distribute its investment in cash or liquid securities to its investors (usually limited partners) or plow the returns back into other promising ventures. Obviously, to achieve high returns, a venture capitalist must have a number of big successes to offset failures and marginal successes. No institution other than the venture capitalist approaches investments with this rationale. As a result, according to industry representatives, aggregate returns on investment for professionally managed venture capital funds historically have averaged 25 percent or more, compounded annually.

Chart 16

LIFE CYCLE OF A NEW ENTERPRISE
MODEL OF A GROWING AND SUCCESSFUL COMPANY



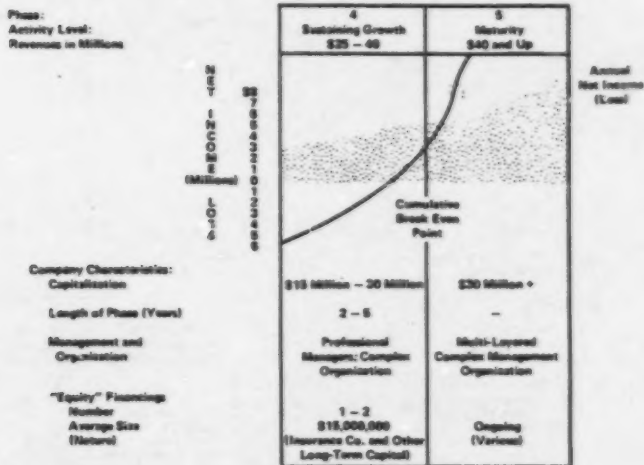
For the issuing company, going public provides new permanent capital in the form of increased equity investment; new borrowing capacity through an improved debt-to-equity ratio; working capital; and capital for expansion, marketing, and perhaps acquisitions of its own.

Sustained growth and maturity

Once a firm has reached annual revenues of \$25 million or more, after-tax net profits of 7 to 8 percent, an annual growth rate of 25 percent, and a solid capital base, it has access to a wide range of financing arrangements, both debt and equity. A well-managed and well-structured organization should continue to grow to maturity.

Chart 17

**LIFE CYCLE OF A NEW ENTERPRISE
MODEL OF A GROWING AND SUCCESSFUL COMPANY**



ROLE OF THE VENTURE CAPITALIST

In summary, the role of the venture capital firm, and in particular the venture capital portfolio manager, is far more than that of simply supplying capital to an entrepreneur to develop and market an idea. As portrayed in chart 18, it is to:

- Analyze the idea from both a technological and business perspective.
- Help the entrepreneur prepare a business plan and an investment prospectus.
- Validate the risk/reward ratio of the plan.
- Assist, as necessary, in locating individuals who together form a highly qualified technical and managerial team.
- Obtain investment capital, including continuing assistance in short term and long term financing.

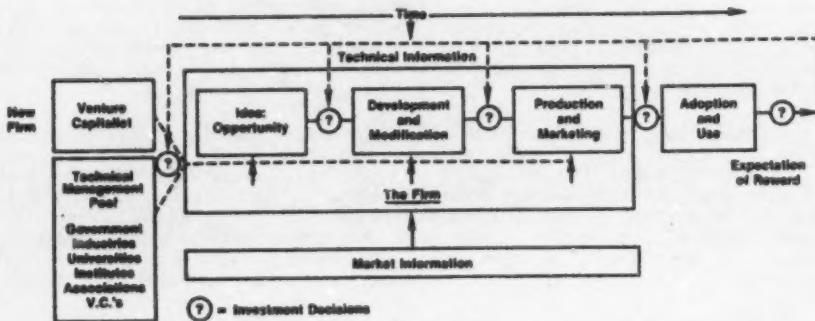
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- Participate as an active adviser to the team to facilitate the success of the fledgling enterprise.
- Assist in developing supplier relations and in marketing products, often through personal contacts with other portfolio companies.

Chart 18

ROLE OF THE VENTURE CAPITALIST



PART 4SENSITIVITY OF THE VENTURE CAPITAL PROCESSTO GOVERNMENT RULES, REGULATIONS, AND POLICIESEFFECT OF POLICY AND RULES CHANGES
ON THE FLOW OF VENTURE CAPITAL

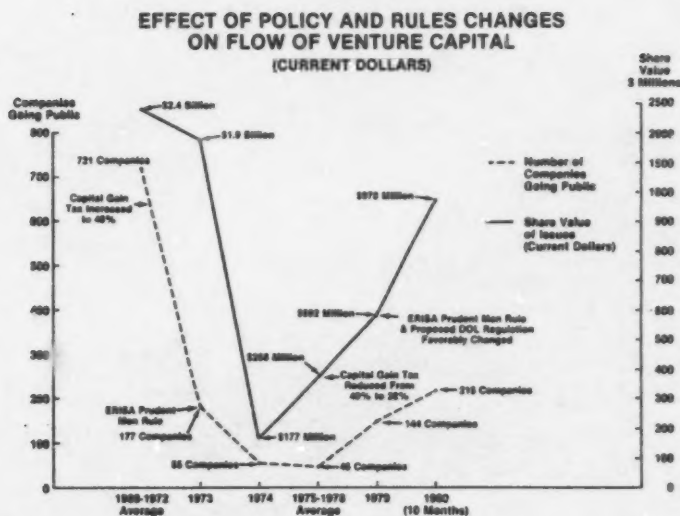
Despite the demonstrated high payoff the venture capital process provides to the Nation, the flows of venture capital, technological innovation, and entrepreneurship have slowed precipitously at various times, as either a direct or an indirect result of Government rules, regulations, and policies. Advocates of the process believe that such results are neither desirable nor necessary and, for the most part, are not intended by policymakers. Their view is that any Government action that affects return on investment, innovation, or the willingness to take risks is immediately felt in the process.

Most Government actions affect the process directly by increasing or decreasing the flow of available capital. According to venture capitalists, the availability of venture capital affects the number and willingness of entrepreneurs to take risks. Often this means the entrepreneur's personal perception of availability. Venture capitalists believe that negative Government actions come about inadvertently because those who make policies and rules lack sufficient understanding of the process to predict their outcome.

One major action frequently pointed to is the Tax Reform Act of 1969. This was the first in a series of tax changes that by 1976 had increased the capital gains tax rate from 24 percent to a maximum 49 percent and significantly altered the tax treatment of stock options. Charts 19 and 20 illustrate the dramatic decline in venture capital and in the number of venture-backed companies going public. Venture capitalists believe this situation resulted directly from the increases in the capital gains tax. Chart 19 figures are in current dollars, and chart 20 figures are in 1969 constant dollars.

From 1968 to 1972, an average of \$2.4 billion was raised in new issues for an average of 721 companies that went public each year. This fell to a low of \$117 million raised for 55 companies in 1974, and a 3-year average of \$258 million for an average of only 45 companies a year during 1975 to 1978. A reversal then occurred with the enactment of the Revenue Act of 1978, which rolled back the capital gains tax to 28 percent. Another boost to the supply of available venture capital came in 1979 when the Department of Labor took a more liberal view of the Employee Retirement Income Security Act (ERISA) "prudence" rule affecting the ability of pension trust fund managers to invest in so-called risky ventures.

Chart 19



SOURCE: Venture Economics and GAO estimate

Note that the \$970 million raised in new issues in the first 10 months of 1980 financed only 216 companies, an average of \$4.5 million per company compared with \$3.3 million per company from 1968 to 1972. This 36-percent increase is evidence of high inflation over the last several years. Even more dramatic was that funds raised in 1980, in 1969 constant dollars (chart 20), amounted to only \$517 million, or an average of only \$2.4 million per company going public. In this context, it appears that either (1) companies going public in 1980 were undercapitalized compared with those in 1968 to 1972, and thus may not achieve the expansion otherwise possible, (2) the companies were better managed, or (3) investors were simply paying more and getting less.

Chart 20

**EFFECT OF POLICY AND RULES
CHANGES ON FLOW OF VENTURE CAPITAL
(CONSTANT DOLLARS)***



SOURCE: Venture Economics and GAO estimate

Government actions cause "ripple" effects

Charts 19 and 20 do not indicate the "ripple" effects that venture capitalists believe were caused by the 1969 and subsequent acts. Entrepreneurs, for example, became less inclined to present business proposals because they knew venture capital was scarce. Such a condition at least infers a slowdown in research and development, especially by individuals. In addition, drawing high-caliber management talent into new ventures was more difficult because there was no incentive for a candidate to abandon a relatively secure career for one laden with risk. That is, the marginal difference between existing salaries and bonuses, versus highly taxed capital gains and stock options, eliminated any monetary advantage of taking such a risk.

The logic of incentivizing this kind of risk is better appreciated when viewed in practical terms. For example, most individuals who meet venture capitalists' criteria of high-caliber management talent are between the ages of 30 and 50. Yet, these are the individuals who have the heaviest financial obligations,

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usually related to family commitments--mortgages, children from infancy to college age, and so on. Unless the potential rewards are significant compared with the financial risks, people in this category will not jeopardize their existing security.

OTHER GOVERNMENT RULES AND REGULATIONS
AFFECTING THE VENTURE CAPITAL PROCESS

Virtually hundreds of rules and regulations affect the venture capital process. They cover a wide range of issues and are administered by different Federal agencies. Tax regulations are administered by the Internal Revenue Service in the Department of the Treasury; securities regulations are administered by the Securities and Exchange Commission; pension fund regulations are administered by the Department of Labor; antitrust regulations are administered by the Federal Trade Commission; health and safety regulations are administered by the Office of Safety and Health Administration in the Department of Labor; patent rules are set by the Congress and administered by the Patent and Trademark Office in the Department of Commerce; environmental regulations are administered by the Environmental Protection Agency; and so on.

Because the range of issues and degree of Government involvement affecting the venture capital process are so great, no single Federal agency or congressional committee has total jurisdiction. Moreover, the venture capital industry has no focal point, mechanism, or conduit through which its concerns can be voiced or where dialog between Government and industry can routinely take place.

If such a mechanism had been in place during the 1970s, venture capital representatives say, much of the adverse impact from Government policies, rules, and regulations experienced during that decade could have been lessened and some may have been avoided altogether.

Venture capitalists expressed a number of views that appear to be particularly noteworthy:

- The basis on which a rule or regulation was originally established changes over time and may cease to exist, making the rule inappropriate.
- The criteria or parameters used originally are often overtaken by such factors as inflation or other economic conditions.
- The potential exists for improving the rulemaking process by gaining more active and direct participation by industry.

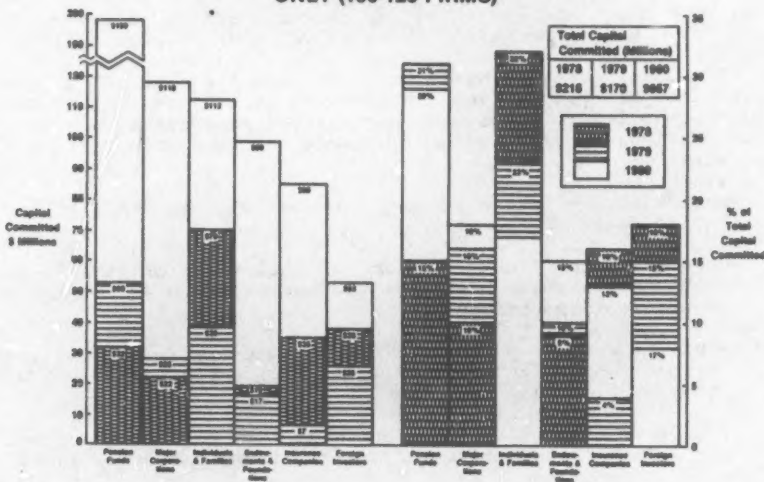
PART 5BRIGHT PROSPECTS FOR THE FUTUREAVAILABILITY OF VENTURE CAPITAL
IS HIGH AND IS GROWING

Venture capital was more readily available in 1981 than at perhaps any time in the Nation's history. New capital committed to venture capital companies of \$657 million in 1980 was nearly 400 percent above the \$170 million committed in 1979. According to Capital Publishing estimates, commitments in 1981 were about \$1 billion and a similar amount is expected in 1982.

As shown on chart 21, the largest investors are pension trust funds, major corporations, wealthy individuals and families, endowments, insurance companies, and foreign investors.

Chart 21

**MAJOR SOURCES OF CAPITAL
COMMITTED—1978-1980—TO THE
INDEPENDENT VENTURE CAPITAL FIRMS
ONLY (100-125 FIRMS)**



SOURCE: Venture Economics and GAO

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Venture capitalists believe the growing availability of venture capital is a direct result of (1) reducing the capital gains tax from 49 percent to 28 percent in 1973, (2) relaxing pension trust fund investment rules in 1979, and (3) further reducing the capital gains tax for individuals from 28 percent to 20 percent in 1981. In their opinion, these changes have created incentives for risktaking not seen in the United States since 1969.

By far the largest source in 1980 was the pension trust funds --\$190 million or 29 percent of the total \$657 million committed-- with an increase of nearly 400 percent over 1978 to 1979. While the Department of Labor has no specific data to support these figures, the general trend appears to be consistent with the primary objective of the Department in setting pension investment policy. That is, to create an environment that gives pension fund managers flexibility to exercise prudent investment strategies over a broad range of opportunities, including venture investments.

A growing number of large corporations are looking to venture capitalists to keep them ahead of inflation. Part of the corporate strategy is to finance new small companies because these historically have been more aggressive.

A number of large corporations have set up venture capital divisions themselves, but few have achieved the level of success that the top 100 to 125 venture capital firms have. Our discussions with venture capitalists and with large corporations attempting to execute the venture capital process confirm that the reason for lack of success is that few of them applied the same rigid criteria for venture investments that are followed by established venture capital firms. One view expressed was that large corporations were very good at 1- to 3-year "product development" decisions, but not at 3- to 7-year "business development" decisions, the latter representing the venture capitalist's forte. Therefore, part of the increase in venture funds from large corporations is a specific corporate strategy to invest in experienced venture capital partnerships to gain a "window" on technology as well as high returns on investment.

Wealthy individuals and families historically have been a primary source of venture capital. The increase in investments by this group in 1980 indicates the more conducive climate for risk-taking created by recent tax policy changes. The large increases in participation by endowments and insurance companies indicate recognition of the venture capital process as a sound investment strategy. The steady increase in foreign participation indicates confidence in the venture capital process and, again, an apparent strategy to gain a window on U.S. technology and markets.

A VENTURE CAPITAL SHORTFALL STILL EXISTS

Despite these increases in available venture capital, a shortfall continues to exist. Depending on how the shortfall is

estimated, it could range from \$5.5 billion to \$13.5 billion on the optimistic side to as high as two to three times these figures on the pessimistic side.

Chart 22

VENTURE CAPITAL SHORTFALL

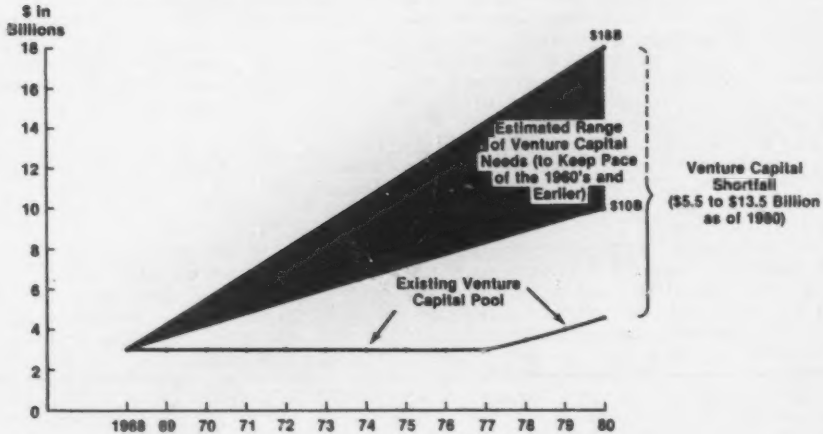


Chart 22 presents a conservative estimate of the shortfall. The top two curves, showing 1980 venture capital needs of \$10 billion to \$18 billion, are based on separate estimates by the Congressional Research Service and Venture Economics. Each study used slightly different assumptions, and each is calculated in constant dollars using pre-1968 venture capital growth as a baseline. In current dollars, this shortfall would be two to three times that shown in the chart. The bottom curve, calculated in current dollars, shows a virtual lack of growth in the venture capital pool during the 1970s but ignores the devastating effect of inflation. This also suggests the actual gap is wider than shown in the chart.

The accuracy of these estimates, however, seems far less important than the fact that recent tax policy changes have created an environment conducive to risktaking. Venture capitalists are confident the current trend in increased availability of venture capital will begin to close the gap and support whatever level of entrepreneurial activity the marketplace dictates.

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Notwithstanding the positive side of these recent policy changes, the significant and relatively sudden turnabout in the availability of venture capital brings to bear a different set of potential problems.

THE NUMBER OF EXPERIENCED VENTURE CAPITALISTS
NEEDS TO INCREASE TO MANAGE
THE GROWING AVAILABILITY OF VENTURE CAPITAL

The paucity of venture capital during the 1970s discouraged the entry and training of new venture capitalists, and the number of experienced venture capitalists declined. Since the process depends heavily on the personal involvement of venture capitalists, which are limited in number, a major challenge to the industry is to train enough competent analysts and portfolio managers to accommodate the growing supply of capital.

Recall that one important criterion of the venture capitalist is that for those new businesses financed, he or she continues as an active participant until the firms have grown to a point that they can go public or merge upward. This means that successful venture capitalists are limited by the number of companies in which they can actively participate--not by the number they can finance. Thus any shortage of experienced venture capitalists takes on more significance.

For example, chart 23 shows rapid growth in new capital committed to organized venture capital companies (broken curve) following the enactment of the Revenue Act of 1978. Then from 1978 to 1979, new capital declined while, in the same period, disbursements by venture capital companies into portfolio companies (solid curve) rose dramatically. As corroborated by the president of the National Venture Capital Association, existing venture capital firms essentially became saturated, which meant that most of their efforts were devoted to investing the capital on hand rather than raising more capital.

To keep pace with the growing supply of capital, at least 29 new venture capital firms came into being between 1979 and 1980, bringing the total number of organized firms to 131 as of May 1982. According to National Venture Capital Association estimates, about 80 to 90 percent of all private venture capital placements are made by its 131 member firms.

A major challenge to the existing venture capital industry is to train, by apprenticeship or some other means, enough competent analysts and portfolio managers to accommodate this large growth in available capital. If this is not done, according to venture capitalists, numerous new, inexperienced, maybe incompetent venture capital firms are likely to be formed. If their investment records and rationale are seriously flawed, the entire industry could suffer. This, in turn, could result in Government rules and regulations that stifle entrepreneurship and could affect the public securities markets. The established venture capital community is very much concerned about this.

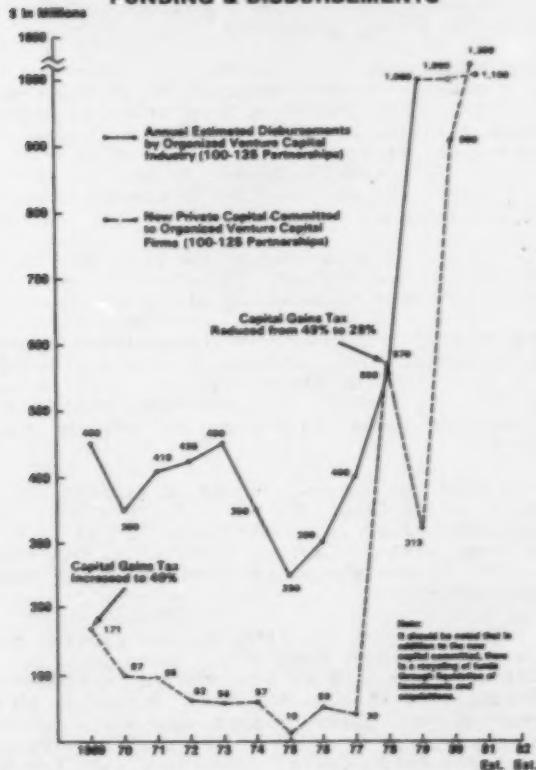
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Venture capitalists believe that learning through apprenticeships is necessary. In fact, the 29 new funds established since 1978 relied heavily on the apprenticeship approach. That is, general partners in most new funds include one or two apprentices and one or two general partners of an earlier fund. This approach, they believe, provides essential continuity and guidance while it increases the number of experienced venture capitalists.

Chart 23

VENTURE CAPITAL INDUSTRY FUNDING & DISBURSEMENTS



SOURCE: Developed by GAO from data provided by Venture Economics.

VENTURE CAPITALISTS MAY NEED
STRENGTHENED STANDARDS OF PROFESSIONALISM

The increased recognition of the importance of the venture capital industry to our free enterprise system, the enhanced encouragement for risktaking, the rise in available capital, and Government's inevitable and necessary role as rulemaker and policy-maker have created an environment in which the venture capital process could be appropriately recognized as a unique professional discipline. To achieve this status, the industry would need to play a primary role by establishing its own generally accepted principles and practices for entry into and operating in the profession.

While the industry founded the National Venture Capital Association in the early 1970s and represents 80 to 90 percent of funding activity, its charter merely admonished its members to "act in a professional manner" without defining what that meant. For example, it did not include standards for entry into the industry, for operating once in the industry, or for compliance monitoring.

A call for generally accepted principles and practices developed by and for the industry would be an expansion of the widespread practice of self-monitoring. Such a practice is followed by the American Bar Association for the legal profession and by the Financial Accounting Standards Board and the American Institute of Certified Public Accountants for the accounting and auditing professions.

There appears to be very practical logic as well. If an adequate number of professional venture capitalists were assured, generally accepted principles and standards would be less needed. Conversely, strengthened standards could lead to improved training and enhanced professionalism. However, if neither exists, an increase in inexperienced venture capitalists in an environment of increased capital could lead to a deterioration of the image of the industry and possibly to a lower rate of success for the process.

In discussing this subject with some industry spokesmen in July 1981, we found agreement that the industry should develop its own set of principles and practices for self-monitoring. They felt that if industry does not develop standards, the Government may. Industry is extremely sensitive to further Government intervention. Industry does not oppose Government rules and regulations and, in fact, recognizes the need for them. However, both Government and industry should be concerned about and want to correct Government actions that cause unexpected turbulence. Ideally, self-monitoring would eliminate the need for some Government rules and mitigate others.

In responding to our June 1982 draft report, the National Venture Capital Association stated that its Board of Directors, in

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April 1982, created a Professional Standards Committee to develop a Code of Professional Standards. The code, comprising seven comprehensive standards, has been developed and adopted by the Board of Directors. As of this report, the code was being circulated to member firms. Membership in the Association, both new and renewal, will require acceptance of the code.

PART 6MAINTAINING AN ENVIRONMENTFOR ENTREPRENEURSHIPGOVERNMENT AND INDUSTRY DIALOG
COULD OFFER A MEANINGFUL FIRST STEP
TOWARD IMPROVED RULES AND POLICYMAKING

The venture capital process as it has evolved is a vital link in our free enterprise system between research and development and the introduction of new productivity enhancing technology into new and fast-growing business enterprises. It is the nucleus of new company stocks that will be traded in public stock exchanges. Government policies, rules, and regulations have caused extreme fluctuations in venture capital activity by controlling the availability and flow of capital. They have also inadvertently interrupted entrepreneurial activity and limited the entrance and training of new venture capitalists.

The sophistication and complexities of the process; the myriad Government policies, rules, and regulations that affect the process; the sensitivity of the industry to Government action; the prospect of too few experienced venture capitalists; and the newness of industry standards preclude specific recommendations. Rather, the many issues involved warrant the creation of a public forum for Government and industry dialog. In its response, the National Venture Capital Association said it "enthusiastically looks forward to the establishment of an appropriate public forum for a more efficient exchange of ideas." Congressional hearings could be an appropriate initial step and, as a minimum, they could address these questions:

- What kind of forum, if any, would be agreeable and beneficial to both Government and industry to exchange views on current or proposed policies, rules, and regulations affecting the venture capital process?
- Should such a forum be established on a permanent or an ad hoc basis?
- Should such a forum be housed in the legislative or the executive branch or both?
- What form of industry participation would be most effective to identify and address issues sensitive to the process; should there be representation by individuals or through the National Venture Capital Association or other organizations?
- What are the prospects of there being too few experienced venture capitalists?

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--How does industry propose to alleviate potential shortages?

--Is there a role for Government in assisting industry?

Open discussion of these and other questions could result in agendas for specific action by both Government and industry which could strengthen the entrepreneurial spirit that has been the backbone of the American free enterprise system.

THE CONTRIBUTIONS OF A SMALL, HIGH-TECHNOLOGY FIRMTO PRODUCTIVITY: A CASE STUDY

This case study demonstrates the remarkable benefits to the Nation's economy that can accrue from the successful application of technology and innovation by a small, high-technology firm. Significant productivity enhancing benefits resulted from the diffusion of the firm's products into the design and manufacturing operations of its customers in a wide variety of industries. Other positive contributions to the gross national product are the substantial number of jobs created by the firm and the tax revenues produced. Since the company operated in foreign markets it also contributed to the Nation's export trade, thus helping to alleviate our trade deficit. This case study also documents the vital contribution by venture capitalists to the development and growth of the company. Indeed, without the commitment of venture capital, it is likely that the firm's entrepreneurial and technological success would not have occurred.

This case study is based on information taken from the company's annual reports, financial investment reference sources, filings with the Securities and Exchange Commission, and--to a lesser extent--periodicals. We visited the company and obtained information on its initial founding and development. We also discussed the productivity benefits accruing from the diffusion of its products among its customers, particularly one large corporation.

THE COMPANY

This case study presents the results achieved by the company from 1969 to 1979. The company, headquartered in Bedford, Massachusetts, is in the industry automation business. It designs, manufactures, markets, and services products that automate the product development and production processes of its customers. Its customers increase productivity, improve product yields, and shorten the new product development or manufacturing cycle by automating complex and repetitive design and manufacturing tasks.

In the year ended December 31, 1979, the firm earned \$12.9 million after taxes, or 9.9 percent of \$131.5 million in sales. Results, by the two industry segments in which the company operates, were:

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	<u>Net sales</u>	<u>Operating profits</u> <u>(note a)</u>
	------(millions)-----	
CAD/CAM systems and products (note b)	\$103.0 (78%)	\$26.9 (99%)
Semiconductor production automation products	<u>28.5</u> (22%)	<u>0.3</u> (1%)
Total	<u>\$131.5</u> (100%)	<u>\$27.2</u> (100%)

a/Before taxes, interest, and general corporate expenses.

b/CAD/CAM stands for "computer aided design/computer aided manufacturing."

For the 9 months before September 30, 1980, the firm's sales were \$161 million and its net income was \$15.9 million (9.9 percent of sales). For all of 1980, the firm anticipated sales of around \$200 million; about 93 to 85 percent was contributed by the CAD/CAM line.

The company markets products and services domestically through its own sales and field service organizations in 35 cities located in 19 States. Internationally, the company has seven wholly owned European sales subsidiaries. It also maintains sales and service locations or operates through international sales representatives in the Far East, Australia, Mexico, Canada, and Venezuela. The company reported that product sales in Europe had nearly doubled during 1979, and that it planned a rapid expansion into the Japanese market in 1980. About 50 percent of its CAD/CAM sales are outside the United States and Canada.

The firm's products have been sold to the electronics, automotive, energy, piping, aerospace, metalworking, semiconductor, and mapping industries; public utilities; and various government agencies.

RAPID DEVELOPMENT AND GROWTH

In the 11 years from its beginning in 1969 to 1979, the company's sales grew from \$51,000 to \$131 million--a compound annual growth rate of over 139 percent. Following losses of about \$1.2 million incurred in the first 2 years of operations, after-tax net income grew from \$70,000 in 1971 to \$12.9 million in 1979, or over 92 percent compounded yearly. During the 11 years the company invested about \$33 million in research and product development and made capital investments in property, plant, equipment, and acquisitions of over \$37 million. No cash dividends were paid during this period.

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STARTUP BY ENTREPRENEURS

The firm was incorporated in Massachusetts during January 1969. The original corporate business strategy was to develop and sell products and systems to increase the productivity and profitability of a wide variety of industries.

The company was founded by two individuals, one of whom was chiefly responsible for the design and development of its original products. The other founder provided overall managerial talent. He has been the firm's president since 1969 and chairman of the board since 1979.

The idea for the company was conceived while both founders were working for a large technologically oriented firm, after extensive discussion with a group of engineering professors. Influenced by their technical backgrounds in design work, the entrepreneurs decided early to concentrate on turnkey systems in the computer graphics market. From a group of about 12 product ideas, they selected 3 of the most feasible. They opened a small office in Waltham, Massachusetts, with about 16 employees. As of March 1980, the founders still owned about 22 percent of the total outstanding stock of the corporation.

VENTURE CAPITAL PROVIDED THE SEED MONEY

A venture capital firm invested about \$320,000 in the company's stock early in 1969 as first-stage financing. During April 1970 a group of six other venture capitalists invested another \$635,000 as second-stage financing. On several occasions during 1971 some of these same investors and other venture capitalists provided additional capital. In all, from April 1970 to February 1972, 17 different venture capitalists invested over \$1 million in the company, of which about \$820,000 represented equity financing by the purchase of company stock. Representatives from two of the venture capital firms served on the company's board of directors and remained with the company after it went public in 1972. A company representative said the firm could not have been developed without the contributions of venture capitalists.

ACQUISITIONS

In its initial development, the firm made two key acquisitions that helped its growth. In 1971, the company purchased another firm through the issuance of stock valued at \$400,000. The acquired company designed, manufactured, sold, and serviced a wide variety of products used in the automated mass production of semiconductor components, principally integrated circuits. The acquired firm's products were used frequently in conjunction with the company's design automation products in systems to increase the productivity of semiconductor manufacturers. Indeed, the initial applications of the CAD/CAM systems were concentrated in the design and production of circuits for the semiconductor industry.

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In August 1974, the company purchased the interactive graphics business (hardware, software systems, and development technology) of another firm. The software complemented the company's existing and planned graphics systems enabling the company to introduce several new systems and expand its markets.

GROWTH OF THE COMPANY'S CAPITAL

At December 31, 1971, after purchase of the semiconductor equipment supplier, the capital of the corporation was \$1.3 million:

	<u>Semiconductor equipment line</u>	<u>Balance</u>	<u>Consolidated</u>
Common stock:			
At par	\$ 10,000	\$ 83,000	\$ 93,000
Excess over par	390,000	1,961,000	2,351,000
	<u>\$400,000</u>	<u>\$2,044,000</u>	<u>\$2,444,000</u>
Accumulated deficit			(1,090,000)
Total			<u>\$1,354,000</u>

The company went public in December 1972, at which time it raised about \$4 million. The proceeds were used to repay all short term borrowing and to provide working capital and funds for plant expansion.

In 1978, the company raised \$9.5 million through another public sale of its common stock. The funds were used to repay all long term bank debt, which amounted to \$9 million at the time of the offering.

The company's capital at December 31, 1979, was \$40.6 million, having grown thirtyfold in the 8 years after 1971, or about 53 percent annually. The principal sources of this growth were public financing and reinvested earnings.

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<u>Sources of capital 1972-79</u>	<u>Amount</u> (millions)	<u>Percentage of total</u>
Public issues	\$13.5	81
Stock options	1.0	6
Employee purchases	1.2	7
Acquisitions and other	<u>0.9</u>	6
Total common stock	\$16.6	42
Retained earnings	<u>22.7</u>	58
Total	<u>\$39.3</u>	100

In 1971, before going public, long term debt was only 16 percent of capital, and between 1972 and 1974 it was only 3 percent of capital. After 1975, the company was obligated to a significant amount of longterm debt. Most of the debt shown for 1978 and 1979 was related to mortgage construction loans.

<u>Year</u>	<u>Long term debt (note a)</u> (millions)	<u>Percentage of long term debt to capital</u>
1975	\$5.9	93
1976	6.4	79
1977	8.2	75
1978	4.2	16
1979	7.7	19

a/In August 1980, the company issued additional stock. The proceeds were used to eliminate all bank debt.

PRODUCTIVITY AND GROWTH BENEFITS CREATED

A company official said that the firm has installed about 800 systems in almost 500 companies. The productivity enhancing benefits of its products have been documented by the company. The reports show how the products became diffused throughout the economy and resulted in significant productivity growth for the users.

In 1978, for example, the company documented the application of its interactive graphics systems by a major U.S. aerospace firm. The director of engineering computing systems of that firm reported that a designer using an interactive graphics system had been able

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to lay out a cockpit instrument panel in 2 hours--about a twenty-fold increase in productivity since this task would have taken a week to do manually. In another instance, the computer graphics manager of a large French manufacturer reported that using the company's system meant a 7-to-1 productivity increase in design of liquor or perfume bottles, two of the firm's most important products.

Officials of a large manufacturer we visited demonstrated several ways their firm was using the CAD/CAM system to increase productivity. The data given us showed that the company was saving staff-hours in drafting technology (primarily in engineering and logistic support work) and in design of integrated logistic support work. All told, the manufacturer saved over 28,000 hours (39 percent) during 1978 to 1979.

An example of the productivity benefits created by the company's semiconductor production automation product line is the case of a large U.S. manufacturer of microcircuits. The company's automatic projection aligners allowed the microcircuits manufacturer to double the memory capacity of a single computer chip each year. As a result, despite increasing raw material prices and inflation, the microcircuits manufacturer was able to reduce its cost per function from over one dollar to less than one-tenth of a cent--more than a thousandfold increase in productivity.

Additional benefits to the economy were created by the successful growth of the firm. During the 11 years from its beginning through 1979, the company created over 2,500 jobs. This number increased to about 4,000 by the end of 1980.

The company also generated tax revenues of almost \$13 million in Federal, State, and foreign taxes on the income it earned. This figure excludes additional taxes resulting from income and payroll taxes produced from the earnings of the company's employees and franchise, payroll, and property taxes paid by the corporation. In 1978 and 1979, for example, the company paid over \$4 million in payroll taxes. During 1978 and 1979, it generated about \$80 million in foreign sales, over 35 percent of which represented export sales from the United States.

APPENDIX IV

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NATIONAL VENTURE CAPITAL ASSOCIATION

1225 19th Street, N.W., Suite 750
 Washington, D.C. 20036
 (202) 659-5756

June 3, 1982

Mr. C. E. Fritts, Group Director
 Private Sector Productivity
 U.S. General Accounting Office
 441 G Street, N.W. - Room 8027
 Washington, D.C. 20548

Dear Mr. Fritts:

We have carefully reviewed your report examining the venture capital process and the implications of that process for the economy of the United States. In our view, your report correctly identifies the key elements of the venture process. The report provides an excellent analysis of each of these elements with sufficient quantitative information to rapidly and accurately provide the reader with perspective concerning the importance of the process to the free enterprise system.

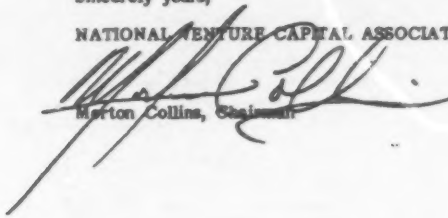
The rapid increase in the availability of capital for the venture process brought about by changes in regulatory and tax policy since 1977 has caused a perceived concern relating to the number of available venture capitalists. The venture industry is currently training apprentices at a very rapid rate to overcome this potential problem. While the number of venture capital firms, each founded by one or more experienced venture capitalists, has increased substantially, so has the number of people employed by each firm. There appears to exist no shortage of highly trained and highly motivated people available to be employed in the venture industry. The free enterprise system works as well in the venture industry as it does in those industries to which the capital is provided.

We concur with your judgement that improved rules and policymaking will flow from enhanced dialogue between government and industry. The National Venture Capital Association was formed to provide a body representative of the venture industry to engage in such dialogue. This dialogue began in earnest when we established our Washington Office in 1977 and has increased dramatically since that time. The National Venture Capital Association enthusiastically looks forward to the establishment of an appropriate public forum for a more efficient exchange of ideas.

Your report provides a very clear and concise overview of the venture process not contained in any other document. We encourage careful study of your report by any individual or organization interested in venture capital or productivity in the economy of the United States.

Sincerely yours,

NATIONAL VENTURE CAPITAL ASSOCIATION


 Morton Collins, Chairman

MC:jfb

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UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Economic Affairs
Washington, D.C. 20230

MAR 30 1982

Mr. Ed Fritts
Group Director
Private Sector Productivity
General Accounting Office
Washington, D.C. 20548

Dear Mr. Fritts:

This is in response to your recent request for comments on the draft Report on the Venture Capital Process. Our brief suggestions and comments are as follows:

The GAO draft report on the venture capital process is generally well prepared and should be quite useful in dispelling some of the mystery concerning the role of the venture capital industry in our economy. The case study of the 72 publicly held corporations was especially educational, in view of the fact that all of those firms were engaged in the production of things designed, manufactured, and marketed specifically to increase the productivity of other firms.

Part IV of the report cites the Tax Reform Act of 1969, which increased the capital gains tax and altered the treatment of stock options, as a major contributor to the subsequent decline in the number of new stock issues. It should be noted that the drop in the flow of venture capital as shown in Charts 19 and 20 began during the 1970 recession and reached a low point during the 1973-75 recession--both periods in which corporate profits plunged sharply. Although it is impossible to isolate the effect of the tax changes from the effect of the business cycle, we believe that the recessions were also a significant factor in the decline in the number of new issues.

In regard to the industry's need for a set of principles and professional practices, we support such an effort. We agree with the GAO report on page 50 a/ that it might be possible to eliminate or reduce some Federal regulation through industry self-monitoring. Such a reduction in regulation would be consistent with the goals of this Administration.

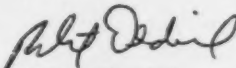
a/Discussion now appears on pp. 38 and 39.

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In October 1980, the Securities and Exchange Commission and the Small Business Administration announced that the two agencies would conduct the first comprehensive study of the utilization of exemptions available under the Securities Act of 1933, focusing on "private placements" and the financing needs of small business. The registration exemptions to be studied included private placement pursuant to section 4(2) of the 1933 Act; a "safe harbor" rule known as Rule 146, which is utilized by firms raising capital under the private placement exemption; Rule 242, which was adopted by the SEC to provide more flexibility in smaller securities offerings; and the SEC's Regulation A, which provides for reduced disclosure requirements for offerings under \$1.5 million. We would suggest that the GAO staff review the results of that study in connection with the discussion contained in Part IV regarding the effect of government rules, regulations, and policies on the venture capital process.

Sincerely yours,



Robert G. Dederick
Assistant Secretary
for Economic Affairs

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